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Recommendations to Improve Preconception Health and Health Care — United States

**A Report of the CDC/ATSDR Preconception Care
Work Group and the Select Panel
on Preconception Care**

INSIDE: Continuing Education Examination

**DEPARTMENT OF HEALTH AND HUMAN SERVICES
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Recommendations to Improve Preconception Health and Health Care — United States

A Report of the CDC/ATSDR Preconception Care Work Group and the Select Panel on Preconception Care

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Summary

This report provides recommendations to improve both preconception health and care. The goal of these recommendations is to improve the health of women and couples, before conception of a first or subsequent pregnancy. Since the early 1990s, guidelines have recommended preconception care, and reviews of previous studies have assessed the evidence for interventions and documented the evidence for specific interventions.

CDC has developed these recommendations based on a review of published research and the opinions of specialists from the CDC/ATSDR Preconception Care Work Group and the Select Panel on Preconception Care. The 10 recommendations in this report are based on preconception health care for the U.S. population and are aimed at achieving four goals to 1) improve the knowledge and attitudes and behaviors of men and women related to preconception health; 2) assure that all women of childbearing age in the United States receive preconception care services (i.e., evidence-based risk screening, health promotion, and interventions) that will enable them to enter pregnancy in optimal health; 3) reduce risks indicated by a previous adverse pregnancy outcome through interventions during the interconception period, which can prevent or minimize health problems for a mother and her future children; and 4) reduce the disparities in adverse pregnancy outcomes.

The recommendations focus on changes in consumer knowledge, clinical practice, public health programs, health-care financing, and data and research activities. Each recommendation is accompanied by a series of specific action steps and, when implemented, can yield results within 2–5 years. Based on implementation of the recommendations, improvements in access to care, continuity of care, risk screening, appropriate delivery of interventions, and changes in health behaviors of men and women of childbearing age are expected to occur. The implementation of these recommendations will help achieve Healthy People 2010 objectives. The recommendations and action steps are a strategic plan that can be used by persons, communities, public health and clinical providers, and governments to improve the health of women, their children, and their families. Improving preconception health among the approximately 62 million women of childbearing age will require multistrategic, action-oriented initiatives.

Introduction

Improving preconception health can result in improved reproductive health outcomes, with potential for reducing societal costs as well (1–4). Preconception care aims to promote the health of women of reproductive age before conception and thereby improve pregnancy-related outcomes (5–7). Therefore, the goals of the 10 recommendations in this report are to improve a woman's health before conception, whether before a first or a subsequent pregnancy. The recommendations are 1) individual responsibility across the lifespan, 2) consumer awareness, 3) preventive visits 4) interventions

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for identified risks, 5) interconception care, 6) prepregnancy checkup, 7) health insurance coverage for women with low incomes, 8) public health programs and strategies, 9) research, and 10) monitoring improvements.

Since 1996, progress in the United States to improve pregnancy outcomes, including low birthweight, premature birth, and infant mortality has slowed, in part, because of inconsistent delivery and implementation of interventions before pregnancy to detect, treat, and help women modify behaviors, health conditions, and risk factors that contribute to adverse maternal and infant outcomes (8). This report discusses several interventions that, if implemented before pregnancy, can improve pregnancy outcomes for women and infants. However, millions of women and couples do not receive such interventions and services (8).

Childbearing is a common experience among women in the United States. In 2000, an estimated 62 million U.S. women were of childbearing age (aged 15–44 years), distributed in approximately equal segments across the age groups of 15–24, 25–34, and 35–44 years (9). By age 25 years, approximately half of all women in the United States have experienced at least one birth, and approximately 85% of all women in the United States have given birth by age 44 years. In 2003, the fertility rate was 66 live births per 1,000 women aged 15–44 years, with highest rates among women aged 25–29 years (114 per 1,000) and lowest rates among women aged >44 years (0.5 per 1,000). A similar age pattern has been observed within racial/ethnic populations, although women aged <25 years who are non-Hispanic black and Native American had higher fertility rates than non-Hispanic whites and Asian/Pacific Islanders. Hispanic women have the highest fertility rates overall and within each age group (10).

In a 2004 survey of women aged 18–44 years, 84% had a health-care visit during the previous year, and slightly more than half (55%) of women of reproductive age obtained preventive health services in any given year, which are opportunities to deliver preconception care (11). Because approximately one third to half of women have more than one primary care provider (i.e., generally a family physician or internal medicine physician and an obstetrician/gynecologist) (12), all providers who routinely treat women for well-woman examinations or other routine visits play an important role in improving preconception health. However, only approximately one of six obstetrician/gynecologists or family physicians had provided preconception care to the majority of the women for whom they provided prenatal care (13). Another study reported that mothers frequently interacted with pediatricians after the birth of one child and before conception of another, which affords another opportunity to promote preconception health care (14). Community health

centers and other Federally Qualified Health Centers (FQHC), including primary care and prenatal care, deliver services to approximately 4.5 million women of childbearing age each year (15). These centers can be used to provide preconception care to women with low incomes (income <200% of the federal poverty level) and with no health insurance.

This report provides recommendations to improve both preconception health and preconception health care. Several of the medical conditions, personal behaviors, psychosocial risks, and environmental exposures associated with negative pregnancy outcomes can be identified and modified before conception through clinical interventions. For certain conditions, opportunities for preventive interventions occur only before conception. Establishing preconception health screening as part of routine care for women of reproductive age has been discussed in previously published reports (2,5,6,7,13,14). However better health care alone will not achieve optimal improvements in women's preconception health and reproductive outcomes. Health promotion activities to modify personal knowledge and attitudes and behaviors related to reproductive risk factors and the use of a reproductive life plan for women and couples also have been proposed (16,17). A reproductive health plan reflects a person's intentions regarding the number and timing of pregnancies in the context of their personal values and life goals. This health plan might increase the number of planned pregnancies and encourage persons to address risk behaviors before conception, reducing the risk for adverse outcomes for both the mother and the infant.

The recommendations should be used by consumers, clinical care providers, public health professionals, researchers, policy makers, and others concerned with the health of women, children, and families. Federal, state, and local public health agencies can play a vital role in translating these recommendations into projects, educational materials, and programs designed to improve preconception health. Primary care providers serving women of reproductive age, including obstetrician/gynecologists, family physicians, nurse midwives, nurse practitioners, and others working in various clinical settings, have an equally critical role to play in implementing these recommendations.

CDC developed these recommendations by 1) reviewing published research; 2) convening the CDC/ASTDR Preconception Care Work Group, representing 22 programs; 3) evaluating presentations of best and emerging practice models at the National Summit on Preconception Care in 2005; and 4) convening the Select Panel on Preconception Care (SPPC), comprised of subject matter specialists on obstetrics and gynecology, nursing, public health, midwifery, epidemiology, dentistry, family practice, pediatrics, and other disciplines. Various databases (e.g., PubMed® [18]) were searched to iden-

tify published studies for review. Search parameters included preconception care, birth outcomes, reproductive health, and women's health. The reports were reviewed by the SPPC of specialists. These recommendations reflect the research, professional opinion, practice in medicine, public health, and related fields, which are sufficient to guide changes in program, practice, and policy. SPPC reviewed evidence to determine the effectiveness of certain interventions of preconception care (e.g., folic acid to prevent neural tube defects and cessation of alcohol use) and identified missed opportunities for dissemination of preconception information. Implementation of these effective interventions can contribute to the health of thousands of women each year.

These recommendations are a strategic plan to improve preconception health through clinical care, individual behavior change, community-based public health programs, and social marketing campaigns to change consumer knowledge and attitudes and practices. In addition, they are designed to increase research knowledge related to preconception health and care and to improve reproductive health outcomes for all women and couples. Policy changes at the local, state, and federal levels will be necessary to support several of these recommendations. These policies will address changes in access, payment, and types of services available. Four goals were established for achieving these recommendations: 1) improve the knowledge and attitudes and behaviors of men and women related to preconception health; 2) assure that all women of childbearing age in the United States receive preconception care services (i.e., evidence-based risk screening, health promotion, and interventions) that will enable them to enter pregnancy in optimal health; 3) reduce risks indicated by a previous adverse pregnancy outcome through interventions during the interconception period, which can prevent or minimize health problems for a mother and her future children; and 4) reduce the disparities in adverse pregnancy outcomes.

Preconception Health and Care

Preconception care is recognized as a critical component of health care for women of reproductive age (1–5,7,16,17,19–25). The main goal of preconception care is to provide health promotion, screening, and interventions for women of reproductive age to reduce risk factors that might affect future pregnancies (7,16,22–25). Preconception care is part of a larger health-care model that results in healthier women, infants, and families (7,16,26–29).

A substantial number of definitions for preconception care have been used (2–5,16,19,30–33). On the basis of previous guidelines and recommendations, SPPC developed a refined definition for preconception care. Preconception care is de-

finied as a set of interventions that aim to identify and modify biomedical, behavioral, and social risks to a woman's health or pregnancy outcome through prevention and management. Certain steps should be taken before conception or early in pregnancy to have a maximal effect on health outcomes. Preconception care is more than a single visit to a health-care provider and less than all well-woman care, as defined by including the full scope of preventive and primary care services for women before a first pregnancy or between pregnancies (i.e., commonly known as interconception care).

Improving preconception health and pregnancy outcomes will require more than effective clinical care for women. Changes in the knowledge and attitudes and behaviors related to reproductive health among both men and women need to be made to improve preconception health. Despite several health promotion campaigns aimed at reducing smoking, misuse of alcohol, intimate partner violence, obesity, human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS), reduction of vaccine-preventable diseases, and exposure to occupational hazards, the majority of U.S. adults are not aware of how these and other health and lifestyle factors influence reproductive health and childbearing (34,35). Preconception health promotion, therefore, should focus on a general awareness among men and women regarding reproductive health and risks to childbearing (26).

Healthy People 2000/2010 Objectives for Improving Preconception Health and Guidelines for Preconception Care

A *Healthy People 2000* objective (objective 14.3) is for 60% of primary care physicians to provide age-appropriate preconception care (36). This objective was deleted from *Healthy People 2010* because it was not being measured. Although no specific objective for preconception exists, several of those specified in *Healthy People 2010* are relevant to preconception health (37,38).

The Institute of Medicine, several national committees, and a substantial number of professional organizations have established guidelines and recommendations regarding the importance and content of preconception health care (1,3,4,30–33). The primary objective of these reports is to improve the health of women, children, and families. The previously issued evidence-based guidelines for preconception care have been summarized and are the foundation for the recommendations developed by SPPC.

The American Academy of Pediatrics (AAP) and the American College of Obstetricians and Gynecologists (ACOG) have classified the main components of preconception care into four categories of interventions: physical assessment, risk

screening, vaccinations, and counseling. Eight areas of risk screening are 1) reproductive awareness; 2) environmental toxins and teratogens; 3) nutrition and folic acid; 4) genetics; 5) substance use, including tobacco and alcohol; 6) medical conditions and medications; 7) infectious diseases and vaccination; and 8) psychosocial concerns (e.g., depression or violence) (3,24,26–31,33).

Preconception care should be an essential part of primary and preventive care, rather than an isolated visit (4,5,21–26,32,39,40). Whereas a prepregnancy planning visit in the months before conception has been recommended (3,19,31), improving preconception health will require changes in the process of care, including the types of screening and risk-reduction interventions offered to women of childbearing age. *Guidelines for Perinatal Care*, jointly issued by AAP and ACOG, has recommended that all health encounters during a woman's reproductive years, particularly those that are a part of preconception care, should include counseling on appropriate medical care and behavior to optimize pregnancy outcomes (41). Recommendations from these organizations are analogous to the risk screening recommended by the American Heart Association for cardiovascular disease (42). Several national organizations have recommended the routine delivery of preconception care. For example, the March of Dimes has recommended that the key physician/primary care provider and the obstetrician/gynecologist take advantage of every health encounter to provide preconception care and risk reduction before and between conceptions, the time when health encounters can improve health status (39).

Preconception Risks Associated with Adverse Pregnancy Outcomes

Risk factors for adverse outcomes among women and infants occur during the preconception period and are characterized by the need to start, and sometimes finish, intervention(s) before conception occurs. In a systematic review, researchers (43) discussed published reports that identified a list of risk factors for which preconception care (i.e., risk assessment, health promotion, and interventions) can be effective.

Women of childbearing age suffer from various chronic conditions and are exposed to (or consume) substances that can have an adverse effect on pregnancy outcomes, leading to pregnancy loss, infant death, birth defects, or other complications for mothers and infants. For example, in 2002, approximately 6% of adult women aged 18–44 years had asthma, 50% were overweight or obese, 3% had cardiac disease, 3% were hypertensive, 9% had diabetes, and 1% had thyroid disorder (44). Dental caries and other oral diseases also are common (>80% of women aged 20–39 years) and associated with complications for women and infants.

In addition to having chronic diseases, a substantial proportion of women who become pregnant engage in high-risk behaviors and contribute to adverse pregnancy outcomes. In 2003, a total of 11% of pregnant women smoked during pregnancy, a risk factor for low birthweight (10), and 10% of pregnant women and 55% of women at risk for getting pregnant (i.e., those not using contraception or using ineffective contraceptive methods or using effective contraceptive methods inconsistently) consumed alcohol, a risk for fetal alcohol syndrome (45). Certain women also continued to engage in high-risk sexual behavior, potentially exposing themselves to sexually transmitted diseases (STDs), including HIV (46). Although a smaller proportion of women used illicit drugs, this high-risk behavior has been associated with adverse outcomes. These behaviors often co-occur, therefore, compounding the risk for adverse outcomes for certain groups. Immunization for adults and infants is critical for preventing infectious diseases (e.g., influenza and pertussis).

Data from the Pregnancy Risk Assessment and Monitoring System (PRAMS) in four states (i.e., Maine, Michigan, Oklahoma, and West Virginia) indicated that 38% of mothers who planned pregnancies and an additional 30% who did not plan pregnancies had one or more indications for preconception counseling, including use of tobacco or alcohol, being underweight, or delayed initiation of prenatal care (47). In Minnesota and Washington, data from a telephone survey of women revealed that pregnancy intention was associated with health behaviors before pregnancy that might influence pregnancy outcome, with the most marked differences in smoking and vitamin use (48).

Preconception health care is critical because several risk behaviors and exposures affect fetal development and subsequent outcomes. The greatest effect occurs early in pregnancy, often before women enter prenatal care or even know that they are pregnant (4,23–25,49). For example, for optimal effect on reducing the risk for neural tube defects, folic acid supplementation should start at least 3 months before conception (50–52). During the first weeks (before 52 days' gestation) of pregnancy, exposure to alcohol, tobacco, and other drugs; lack of essential vitamins (e.g., folic acid); and workplace hazards can adversely affect fetal development and results in pregnancy complications and poor outcomes for both the mother and infant (45,53–58). This evidence demonstrates the potential impact of preconception care on the health of women and their infants.

Social determinants of women's health also play a role in pregnancy outcomes. The health status of minority women with low incomes contributes to persistent, and sometimes increasing, disparities in birth outcomes. In one study, the reduced overall health status (including poorer physical and

emotional health) of women with low income during the month before pregnancy was associated with an increased risk for preterm labor (59). Socioeconomic status directly and indirectly influences three major determinants of health: health-care access, environmental exposure, and health behavior (60,61). Racial inequalities in access to effective treatment also influence these determinants of pregnancy outcomes for women and infants (62–64).

The following selected preconception risk factors for adverse pregnancy outcomes and evidence for the effectiveness of preconception care have been used to develop clinical practice guidelines (e.g., AAP and ACOG).

- **Isotretinoin.** Use of isotretinoin (e.g., Accutane®) in pregnancy to treat acne can result in miscarriage and birth defects. Effective pregnancy prevention should be implemented to avoid unintended pregnancies among women with childbearing potential who use this medication (65–67).
- **Alcohol misuse.** No time during pregnancy is safe to drink alcohol, and harm can occur early, before a woman has realized that she is or might be pregnant. Fetal alcohol syndrome and other alcohol-related birth defects can be prevented if women cease intake of alcohol before conception (68–73).
- **Anti-epileptic drugs.** Certain anti-epileptic drugs are known teratogens (e.g., valproic acid). Recommendations suggest that before conception, women who are on a regimen of these drugs and who are contemplating pregnancy should be prescribed a lower dosage of these drugs (74–78).
- **Diabetes (preconception).** The three-fold increase in the prevalence of birth defects among infants of women with type 1 and type 2 diabetes is substantially reduced through proper management of diabetes (79–82).
- **Folic acid deficiency.** Daily use of vitamin supplements containing folic acid has been demonstrated to reduce the occurrence of neural tube defects by two thirds (83–88).
- **Hepatitis B.** Vaccination is recommended for men and women who are at risk for acquiring hepatitis B virus (HBV) infection. Preventing HBV infection in women of childbearing age prevents transmission of infection to infants and eliminates risk to the woman of HBV infection and sequelae, including hepatic failure, liver carcinoma, cirrhosis, and death (89–91).
- **HIV/AIDS.** If HIV infection is identified before conception, timely antiretroviral treatment can be administered, and women (or couples) can be given additional information that can help prevent mother-to-child transmission (46,92–97).

- **Hypothyroidism.** The dosages of Levothyroxine® required for treatment of hypothyroidism increase during early pregnancy. Levothyroxine® dosage needs to be adjusted for proper neurologic development of the fetus (98–100).
- **Maternal phenylketonurea (PKU).** Women diagnosed with PKU as infants have an increased risk for delivering neonates/infants with mental retardation. However, this adverse outcome can be prevented when mothers adhere to a low phenylalanine diet before conception and continue it throughout their pregnancy (101,102).
- **Rubella seronegativity.** Rubella vaccination provides protective seropositivity and prevents congenital rubella syndrome (49,103,104).
- **Obesity.** Adverse perinatal outcomes associated with maternal obesity include neural tube defects, preterm delivery, diabetes, cesarean section, and hypertensive and thromboembolic disease. Weight loss before pregnancy reduces these risks (105–109). Appropriate weight loss and nutritional intake before pregnancy reduces these risks.
- **Oral anticoagulant.** Warfarin, which is used for the control of blood clotting, has been demonstrated to be a teratogen. To avoid exposure to warfarin during early pregnancy, medications can be changed to a nonteratogenic anticoagulant before the onset of pregnancy (110–112).
- **STD.** *Chlamydia trachomatis* and *Neisseria gonorrhoeae* have been strongly associated with ectopic pregnancy, infertility, and chronic pelvic pain. STDs during pregnancy might result in fetal death or substantial physical and developmental disabilities, including mental retardation and blindness (113,114). Early screening and treatment prevents these adverse outcomes.
- **Smoking.** Preterm birth, low birthweight, and other adverse perinatal outcomes associated with maternal smoking in pregnancy can be prevented if women stop smoking before or during early pregnancy. Because only 20% of women successfully control tobacco dependence during pregnancy, cessation of smoking is recommended before pregnancy (115–118).

Several providers and maternal and child health researchers have recommended that health risks and behaviors be addressed during any encounter with the health-care system because approximately half of pregnancies in the United States are unintended (20,22,27,119,120). One clinical trial has indicated that provision of preconception care can increase pregnancy planning and intention (121). This finding is vital because studies have consistently demonstrated that planned pregnancies typically have improved outcomes for both women and infants.

Preconception Prevention and Intervention

Since 1987, several reviews of published reports have assessed the evidence and documented the effectiveness for specific preconception interventions (2,5,33,43). A systematic review of 21 research trials published during the 1990s have strengthened the evidence base for preconception care in particular areas (e.g., folic acid deficiency, maternal PKU, and oral anticoagulant; 43).

The effectiveness of several interventions that address the risk factors for adverse outcomes (19,33,43) have been documented, including folic acid supplementation (51,52,122–125); appropriate management of hyperglycemia (126–131); rubella, influenza, and hepatitis vaccination; low phenylalanine diet (132–134); and provision of antiretroviral medications to reduce the risk for mother-to-child HIV transmission (97). Interventions for smoking and alcohol cessation (135–139) have been demonstrated to be effective in certain populations; however, they have been less effective with persons at highest risk (e.g., injection-drug users and polysubstance users).

A list of core interventions exist that are part of preconception care services. These interventions are risk-specific; providers can screen and provide appropriate interventions for persons who need them. However, the best evidence for the effectiveness of these specific components of preconception care has been documented when the focus of delivery was on a single risk behavior and accompanying intervention, rather than delivery of multiple interventions.

Because of the direct links between a mother's oral health and her offspring's risk for dental caries, dental interventions can reduce the risk for prematurity and low birthweight (140–143). Evidence supporting interventions to reduce mother-to-child transmission of cariogenic bacteria supports recommendations for the appropriate use of fluorides and dietary control to reduce maternal salivary reservoirs of cariogenic bacteria, particularly for women who have experienced high rates of dental caries (140).

Interventions that address multiple pregnancy-related risk behaviors simultaneously have not been systematically evaluated and are less commonly delivered. The U.S. Preventive Services Task Force (USPSTF) evaluated the effectiveness of interventions related to smoking, alcohol misuse, and obesity, based on studies of interventions delivered in primary care settings that were not complicated by the additional delivery of multiple components of preconception care (69,70,144–147). These effective methods for intervention (e.g., the Five As [Ask, Advise, Assess, Assist, and Arrange]) for smoking cessation and brief counseling interventions to

reduce alcohol misuse, as identified by USPSTF, provide models for the delivery of multiple interventions that can be adapted and tested (69,70). One study has reported the effectiveness of comprehensive preconception care; however, the findings have limited applicability for the implementation of preconception health-care services in the United States because the study was conducted in Hungary (147).

One priority for preconception care activities is to ensure that evidence-based interventions are implemented to further improve infant and maternal pregnancy outcomes among women living with chronic conditions. Clinical practice guidelines (CPGs) for preconception care for specific maternal chronic health conditions have been developed by several national health professional groups (25–28). For example, the American Diabetes Association has developed CPGs that should be followed before pregnancy for women with diabetes (81). The American Association of Clinical Endocrinologists has developed CPGs for women with hypothyroidism who are attempting to conceive (100). CPGs have also been developed for women being treated with teratogenic medications to guide the transition to safer medications. CPGs for women considering pregnancy and who are using anti-epileptic drugs or oral anticoagulants have been developed by the American Academy of Neurology (77) and the American Heart Association/American College of Cardiologists (78), respectively.

Whereas the evidence supporting specific interventions and the importance of intervening before pregnancy are definitive, limited evidence is available to determine effective methods for delivering preconception care and improving preconception health. Only a limited number of studies regarding effectiveness of interventions have been tested for increasing preconception screening, counseling, and intervention in primary care settings (121,148,149). In one randomized clinical trial, preconception risk factors were identified among women who sought care at a hospital primary care clinic for a pregnancy test. In this trial, an average of nine risk factors per woman was identified at the time of a negative pregnancy test. However, notifying women and their clinicians of identified preconception risks did not improve intervention rates (148). In another study in which didactic lectures and chart cues were used, significant increases occurred in risk screening for medical risk factors (15%–44%), medications (10%–30%), domestic violence (10%–57%), and nutrition (9%–50%) among nonpregnant women who attended an inner-city hospital gynecologic clinic. However, intervention rates and provider attitudes toward preconception care did not change substantially (149). A prospective study of the effect of preconception health promotion on intendedness of pregnancy revealed that women in a family planning clinic who

had received the intervention (22%) during routine visits were more likely to report intended pregnancies than those patients in the same clinic who were not exposed to the intervention (15) (121).

A limited number of studies have assessed the best methods for integrating interventions to achieve maximum impact and optimize the use of limited resources. As with other types of preventive care services, time constraints limit physicians' ability to deliver health promotion interventions (144). Preconception care interventions can potentially be integrated into a limited number of model visits to focus on specific content at different visits, as is done for well-child care (150). Integrated and coordinated care services might also provide additional support to improve health outcomes. For example, an evaluation of the quality of care in the National Centers of Excellence in Women's Health indicated that women served in these centers, compared with community samples, received more clinical preventive services and had higher satisfaction levels (151). Another approach (e.g., self-management) to integrated service of delivery has been illustrated in CDC's recommendations in *Strategies for Reducing Morbidity and Mortality from Diabetes Through Health-Care System Interventions and Diabetes Self-Management Education in Community Settings: A Report on Recommendations of the Task Force on Community Preventive Services* (152). HIV intervention efforts also have suggested that integrated interventions address substance use and reduce sexual risk behaviors simultaneously.

The purpose of preconception care is to deliver risk screening, health promotion, and effective interventions as a part of routine health care. In the United States, this approach is the standard used to achieve prevention of vaccine-preventable disease, heart disease, diabetes, and other chronic conditions. This approach is similar to well-child care, prenatal care, and adult wellness care in which studies have demonstrated the effectiveness of individual components rather than the effectiveness of combined interventions. However, effectiveness depends on ongoing monitoring of health status with interventions.

Preconception care should be tailored to meet the needs of the individual woman. Because preconception care needs to be provided across the lifespan and not during only one visit, certain recommendations will be more relevant to women at different life stages and with varying levels of risk. Health promotion, risk screening, and interventions are different for a young woman who has never experienced pregnancy than for a woman aged 35 years who has had three children. Women with chronic diseases, previous pregnancy complications, or behavioral risk factors might need more intensive interventions. Such variations also place constraints on how interventions can and should be integrated.

Context and Frame Work for Recommendations

The recommendations are designed to promote optimal health throughout the lifespan for women, children, and families by using both clinical care and population-focused public health strategies. In this report, the approach to promoting preconception health is not a single clinical visit but a process of care and interventions designed to address the needs of women during the different stages of reproductive life. SPPC has encouraged the use of a broad definition of prenatal care that includes ongoing preconception interventions, the addition of a prepregnancy visit, multiple postpartum visits, and the currently recommended prenatal care visits. Preconception care offers health services that allow women to maintain optimal health for themselves, choose the number and spacing of their pregnancies and, when desired, prepare for a healthy baby. Interventions and health care that occur before and between pregnancies are included in this report. This review identified areas for which further research is needed (43). Increasing evidence-based research of clinical and public health interventions by using both qualitative and quantitative methods is essential to the fulfillment of these recommendations.

Each of the 10 recommendations has specific action steps that can be implemented in the next 2–5 years. Increasing access to and use of preconception care will not occur immediately; diffusion of innovation theory demonstrates how slowly concepts and best practices are typically disseminated (153,154). The action steps recommend revision of professional standards of care, modification of provider behaviors, development of effective health promotion messages, changes in consumer behavior, and adjustments to payment mechanisms. In addition, the recommendations emphasize individual behavior and responsibility for improving preconception health and identify specific evidence-based strategies for modifying individual knowledge and attitudes and behaviors across the lifespan. The recommendations promote changes in clinical care, public health programs at the federal, state, and local levels, and other community-based programs. For example, quality improvement strategies, commonly used today in clinical practice, might be used to modify provider knowledge and attitudes and behaviors. In addition to participation among traditional partners in public health interventions, improving preconception health will require increased involvement from partners in various sectors (e.g., education, housing, urban planning, and environmental health). These partners should be included as part of the comprehensive solution to improve women's health and the health of families. Approaches to improve surveillance, performance monitoring, and results accountability have been recom-

mended along with strategies to integrate care, develop complementary approaches, and reduce duplication of activities among different professional and programmatic stakeholders.

The risk and the burden of disease is unequally distributed, and a small number of women experience the majority of the pregnancy-related morbidity and mortality, which suggests that a two-step approach to implementing interventions would be beneficial. The first step would target women at highest risk (whether the risks are biologic or social) to reduce morbidity and mortality. The second step would aim to improve preconception health for all women of reproductive age, regardless of risk status. The recommendations emphasize targeting interventions for groups of women with known risks and conditions (e.g., those with previous poor pregnancy outcomes or chronic conditions).

Culturally and linguistically appropriate systems of care are needed to ensure maximal use and impact of preconception health-care services. By increasing the acceptability, effectiveness, and impact of the health-care system through these changes, persons involved in improving preconception health care have the opportunity to address and reduce health disparities.

The recommendations are a starting point to make comprehensive preconception care a standard of care in the United States and to provide a more universal, comprehensive, evidence-based model of preconception care. The recommendations will promote the development and practice of preconception care that will be flexible to meet persons' changing reproductive care needs and address risks throughout their lifespan.

How the Recommendations were Developed

The recommendations were developed through the collaborative efforts of CDC and external partners to 1) target life stages in reproductive-aged women; 2) encourage special interest groups to collaborate to achieve common goals; 3) encourage scientific and public health collaboration; and 4) address health impact, public health systems, efficiency, and effectiveness.

During 2003, a review of studies published regarding maternal and child health and preconception care was conducted by CDC to assess preconception care. The CDC work group also discussed opportunities for collaboration across programs.

Several CDC programs in the work group had previously identified specific interventions with scientific evidence which, if delivered before conception, would promote preconception health and improve pregnancy-related outcomes. These

programs recognized the need to integrate these interventions with similar services to improve coverage, effectiveness, access, efficiency, and ultimately maternal and infant pregnancy outcomes. The need for preconception health promotion and care was identified as a critical public health topic by CDC and partners. As a result, a broader working group of national organizations involved in preconception health issues were established (Appendix).

In November 2004, the CDC work group and representatives of 16 external organizations discussed the evidence supporting preconception care to determine the steps that can be taken to develop national recommendations. The consensus of the participants was that a larger meeting on preconception care and an interdisciplinary panel of specialists should be convened in 2005. A steering committee and planning committee were established (including representatives from CDC and external partners) to plan for a national summit and to bring together a group of specialists with experience in data, practice, and policy issues related to preconception health.

In June 2005, a national summit on preconception care was convened to gather information concerning promising practice models. The summit agenda was developed based on 68 submitted abstracts and reflected various preconception project models, finance approaches, and research questions (CDC, unpublished data, 2005).

In conjunction with the summit, CDC convened SPPC, which included various subject matter specialists and representatives from national organizations concerned about the health of women, infants, and families. A Delphi technique was used to identify subject matter specialists to serve on SPPC. SPPC discussed recommendations regarding clinical practice, public health/community programs, research/data, and policy/finance.

Initial recommendations were sent to the CDC work group, panel members, and additional subject matter specialists from academic and professional backgrounds for comment and review. Reviewers shared their comments in writing or as part of a series of conference calls convened by the SPPC steering committee.

Recommendations to Improve Preconception Health

Ten recommendations were developed for improving preconception health through changes in consumer knowledge, clinical practice, public health programs, health-care financing, and data and research activities. Each recommendation has specific action steps. If each action step is implemented, benefits might be observed within 2–5 years, which would

help achieve the *Healthy People 2010* objectives to improve maternal and child health outcomes. The recommendations are aimed at achieving four goals, based on personal health outcomes.

Goal 1. Improve the knowledge and attitudes and behaviors of men and women related to preconception health.

Goal 2. Assure that all women of childbearing age in the United States receive preconception care services (i.e., evidence-based risk screening, health promotion, and interventions) that will enable them to enter pregnancy in optimal health.

Goal 3. Reduce risks indicated by a previous adverse pregnancy outcome through interventions during the interconception period, which can prevent or minimize health problems for a mother and her future children.

Goal 4. Reduce the disparities in adverse pregnancy outcomes.

The recommendations are a strategic plan for improving the health of women, their children, and their families and are based on existing knowledge and evidence-based practice. Improving preconception health among the estimated 62 million women of childbearing age (9) will require a multistrategy, action-oriented initiative.

The recommendations, which are not prioritized, should be used by consumers, public health and clinical providers, researchers, and policy makers. Therefore, the recommendations should be implemented simultaneously. In the action steps, persons, public health and clinical providers, communities, governments (i.e., local, state, and federal), and professional organizations all have roles. Finally, these recommendations are designed to reduce disparities in maternal and infant health by improving the preconception health of women and men.

Recommendations

Recommendation 1. Individual Responsibility Across the Lifespan. Each woman, man, and couple should be encouraged to have a reproductive life plan.

The target population for preconception health promotion is women, from menarche to menopause, who are capable of having children, even if they do not intend to conceive. To reach such a broad group, a lifespan perspective is needed (3,17,20), which is commonly used in efforts to reduce chronic diseases, particularly cardiovascular disease. For example, persons are encouraged to consider the role of genetic and dietary factors in determining their risk for high cholesterol and to modify their behaviors according to cumulative individual risks (e.g., changes in diet, exercise, or medications) (155). Similarly, a lifespan approach can be used to focus in-

dividual attention on reproductive health to reduce unintended pregnancies, age-related infertility, fetal exposures to teratogens, and to improve women's health and pregnancy outcomes (20).

Certain researchers, providers, and health-care advocates have suggested developing a reproductive health life plan for young women and couples as they enter their reproductive years. However, reproductive health life plans have not been systematically implemented and evaluated (23,26,29,33). Implementing such a reproductive health life plan will require a change in provision of health services and health promotion (Box 1).

Box 1. Recommendation 1 preconception health action steps

- Develop, evaluate, and disseminate reproductive life planning tools for women and men in their childbearing years, respecting variations in age; literacy, including health literacy; and cultural/linguistic contexts.
- Conduct research leading to development, dissemination, and evaluation of individual health education materials for women and men regarding preconception risk factors, including materials related to biomedical, behavioral, and social risks known to affect pregnancy outcomes.

Recommendation 2. Consumer Awareness. Increase public awareness of the importance of preconception health behaviors and preconception care services by using information and tools appropriate across various ages; literacy, including health literacy; and cultural/linguistic contexts.

Consumers should be more involved in improving preconception care services. Knowledge and attitudes and behaviors related to reproductive health are influenced by childhood experiences and prevailing social norms among adults. Certain U.S. adults are not aware of the factors that influence reproductive health and childbearing (34,35). The preconception guidelines from Canada state that preconception care is 1) physical preparation for pregnancy and parenting and 2) the social, psychological, and spiritual components of pregnancy. The factors that influence attitudes regarding preconception care include a person's age and life stage, their childbearing history, and their life priorities (156).

Activities specifically designed to improve school general health education are an essential step in improving reproductive awareness. Efforts to inform adults regarding the risks and opportunities to improve their health are equally important. Several health promotion campaigns provide opportunities to change adult knowledge and attitudes and behaviors,

including campaigns designed to reduce tobacco use, promote responsible use of alcohol, and encourage healthy diet and optimal weight. Campaigns can include messages concerning reproductive health and childbearing. Such campaigns typically focus on the effect of adverse behaviors on children and do not include parallel messages regarding the potential impact on childbearing. New social marketing and health promotion campaigns that focus on how to prepare for childbearing and parenting can influence the behavior of men and women. For example, folic acid intake has been promoted among women of childbearing age (123). Similar to efforts to reduce teenage childbearing or increase use of prenatal care, the media can play a vital role in promoting reproductive awareness (157).

Success in improving preconception health will require changes in public attitudes and has been achieved in other areas (e.g., attitudes changed during the previous 10 years regarding tobacco use, infant sleep position, or vaccinations for infants and toddlers instead of preschoolers) (158). A critical tool for stimulating these changes is social marketing, which is designed to influence the voluntary behavior of targeted audiences to improve their well-being (159,160).

Consumer-friendly tools can help women self-assess risks, make plans, and take actions that will improve their health and that of their children. More consumer-focused research is needed to determine which messages and tools might be effective to encourage reproductive life planning. The SPPC members have suggested that such research explore which terms the public best understands, what messages might increase demand for services, and how touch-screen kiosks or other technology might be used to promote knowledge of preconception health topics (Box 2).

Recommendation 3. Preventive Visits. As a part of primary care visits, provide risk assessment and educational and health promotion counseling to all women of childbearing age to reduce reproductive risks and improve pregnancy outcomes.

Integration of preconception components into primary care can better serve women across their lifespan and at various levels of risk. Primary care integrates various health promotion, prevention, and acute care services to address the majority of personal health-care needs and common health problems in a community setting. Primary care also might include screening for and ongoing management of chronic conditions in a primary care setting. Elements of preconception care can be integrated into every primary care visit.

Professional guidelines for clinicians (i.e., obstetrician/gynecologists, family practice physicians, certified nurse midwives, and nurse practitioners) who provide the majority of primary care to women in the United States should include

Box 2. Recommendation 2 preconception health action steps

- Develop, evaluate, and disseminate age-appropriate educational curricula and modules for use in school health education programs.
- Integrate reproductive health messages into existing health promotion campaigns (e.g., campaigns to reduce obesity and smoking).
- Conduct consumer-focused research to identify terms that the public understands and to develop messages for promoting preconception health and reproductive awareness.
- Design and conduct social marketing campaigns necessary to develop messages for promoting preconception health knowledge and attitudes, and behaviors among men and women of childbearing age.
- Engage media partners to assist in depicting positive role models for lifestyles that promote reproductive health (e.g., delaying initiation of sexual activity, abstaining from unprotected sexual intercourse, and avoiding use of alcohol and drugs).

routine risk assessment through screening (14,24,28,29,33). Different guidelines recommend eight to 10 specific areas for preconception risk assessment, including: 1) reproductive history; 2) environmental hazards and toxins; 3) medications that are known teratogens; 4) nutrition, folic acid intake, and weight management; 5) genetic conditions and family history; 6) substance use, including tobacco and alcohol; 7) chronic diseases (e.g., diabetes, hypertension, and oral health); 8) infectious diseases and vaccinations; 9) family planning; and 10) social and mental health concerns (e.g., depression, social support, domestic violence, and housing) (5–7,30,31,33,40,41).

In addition to risk assessment or screening, professional guidelines include health promotion education and counseling related to reproductive health risks. Such activities should routinely include promotion of healthy behaviors; discussion of child spacing, family planning, and unintended pregnancy prevention; counseling concerning healthy diet, folic acid supplementation, and optimal weight; immunization for infectious disease; information regarding the importance of early prenatal care; and counseling concerning the availability of social and financial support programs.

For women with identified risks, additional counseling, testing, and brief interventions (e.g., for smoking, alcohol, or changes in prescription medications) can be conducted in the primary care setting (68–70,116–118). Certain women will need additional intensive interventions and specialty care. Whereas evidence and clinical guidelines exist that support several preconception care interventions, data are needed to determine the effectiveness of integrating those interventions

(e.g., a limited number of model visits), as is done for well-child care.

Clinical practice can be influenced by evidence-based guidelines, but additional strategies are needed to promote widespread adoption of professional guidelines (25,30–33,151–154). In the recommended action steps (Box 3), additional activities should be provided to support changes in primary care provider knowledge and attitudes and practices. Consolidation of existing guidelines, better tools, and use of quality improvement techniques have fostered changes in knowledge and practices (161–164). For example, the Bright Futures Program has consolidated guidelines for child health, and the Bright Futures for Women's Health and Wellness offers models and opportunities for links to preconception care (165).

Community health centers and other FQHC can be a key point of dissemination for strategies to improve preconception health. FQHC are a critical source of primary care for millions of women with low incomes and no insurance. Perinatal care for 332,000 women account for one of every 10 U.S. births (166). Among FQHC, the Health Disparities Collaboratives (HDC) Initiative is designed to improve the quality of primary care delivered, and approximately 600 FQHCs have participated (167). The HDC model relies on partnerships among community clinics, federal agencies, and national organizations. HDC started with a chronic disease care model for quality improvement, and a primary health-care model integrated with the perinatal care collaboratives and other efforts has been developed.

Recommendation 4. Interventions for Identified Risks.

Increase the proportion of women who receive interventions as follow-up to preconception risk screening, focusing on high priority interventions (i.e., those with evidence of effectiveness and greatest potential impact).

Timely preconception interventions for certain conditions can substantially improve maternal health and birth outcomes (4,43). Separating childbearing from the management of chronic health problems and infectious diseases places women, their future pregnancies, and their future children at unnecessary risk (7,20,24,149). Conditions and risk factors have been identified for which the following exist 1) evidence of potential harm to mother or baby, 2) high prevalence of adverse pregnancy outcome or effective interventions for reducing adverse pregnancy outcomes, and 3) one or more effective interventions that have been evaluated.

Certain women and men need additional counseling and interventions. For example, women who have conditions treated with medications that are known teratogens (e.g., anticonvulsant or anticoagulant medications and isotretinoin) might need to change prescriptions. Women with medical

Box 3. Recommendation 3 preconception health action steps

- Increase health provider (including primary and specialty care providers) awareness regarding the importance of addressing preconception health among all women of childbearing age.
- Develop and implement curricula on preconception care for use in clinical education at graduate, postgraduate, and continuing education levels.
- Consolidate and disseminate existing professional guidelines to develop a recommended screening and health promotion package.
- Develop, evaluate, and disseminate practical screening tools for primary care settings, with emphasis on the 10 areas for preconception risk assessment (e.g., reproductive history, genetic, and environmental risk factors).
- Develop, evaluate, and disseminate evidence-based models for integrating components of preconception care to facilitate delivery of and demand for prevention and intervention services.
- Apply quality improvement techniques (e.g., conduct rapid improvement cycles, establish benchmarks and brief provider training, use practice self-audits, and participate in quality improvement collaborative groups) to improve provider knowledge and attitudes, and practices and to reduce missed opportunities for screening and health promotion.
- Use the federally funded collaboratives for community health centers and other Federally Qualified Health Centers to improve the quality of preconception risk assessment, health promotion, and interventions provided through primary care.
- Develop fiscal incentives for screening and health promotion.

conditions associated with increased risks for morbidity and mortality to mother and fetus (e.g., diabetes, hypertension, heart disease, rubella sero-negativity, thrombophilias, dental disease, or obesity) need to control these conditions. Women with behaviors associated with increased health risks for the fetus (e.g., smoking and alcohol and illicit drug use) also need targeted interventions. Another group with specific counseling needs includes prospective parents with a family history of inherited (i.e., genetic) disorders.

The preparers of this report analyzed the National Ambulatory Medical Care Survey (168) and demonstrated that diabetes affects approximately 1.85 million (21 per 1,000) women in the United States aged 18–44 years, and that preconceptional diabetes management has the potential to reduce the risk for pregnancy loss and congenital malformation for approximately 113,000 births per year. Anti-epileptic/

antiseizure drugs are prescribed for approximately 1 million women (19 per 1,000), potentially affecting an estimated 75,000 pregnancies. Approximately 7 million (125 per 1,000) women of childbearing age are frequent drinkers, and without preconception interventions, alcohol misuse might affect approximately 577,000 births per year (168). Women with chronic medical conditions and their specialty providers should take advantage of every opportunity to discuss preconception health and risks. These conditions and risk factors affect substantial proportions of the approximately 4 million pregnancies that occur in the United States each year.

Studies of preconception care have indicated that providers do not routinely provide interventions for identified preconception risks (23,147,148,164,169). Dissemination of professional guidelines and evidence-based interventions are two vital ways to encourage changes in practice. However, quality improvement tools and techniques offer increased potential, particularly for specific interventions for women with identified conditions (162,170). Research has increasingly indicated that providers and health-care organizations are more likely to engage in evidence-based or best clinical practices, after participation in quality improvement projects (e.g., rapid improvement cycles using the plan/do/study/act approach, collaborative groups, or the model of improvement process that involves an aim/change/measure cycle) (162,170). Incorporation of preconception care modules into the curricula of medical graduate, postgraduate, and continuing medical education might be another method of disseminating messages regarding the importance and content of preconception care for women (Box 4).

Recommendation 5. Interconception Care. Use the interconception period to provide additional intensive interventions to women who have had a previous pregnancy that ended in an adverse outcome (i.e., infant death, fetal loss, birth defects, low birthweight, or preterm birth).

Experiencing an adverse outcome in a previous pregnancy is an important predictor of future reproductive risk (171–173). However, many women with adverse pregnancy outcomes do not receive targeted interventions to reduce risks during future pregnancies. Each year, approximately 28,000 infants die during the first year of life (171). Approximately 12% of all births are preterm (i.e., <37 weeks' gestation) (10), and an estimated 3% of infants are born with birth defects (174). Whereas a preterm birth is identified on birth certificates and a woman's primary care provider typically knows this information, professional guidelines do not include systematic follow-up and intervention for women with this critical predictor of risk.

Postpartum visits are an opportunity to link women to interventions designed to reduce risks to them and their future chil-

Box 4. Recommendation 4 preconception health action steps

- Increase health provider (including primary and specialty care providers) awareness concerning the importance of ongoing care for chronic conditions and intervention for identified risk factors.
- Develop and implement modules on preconception care for specific clinical conditions for use in clinical education at graduate, postgraduate, and continuing education levels.
- Consolidate and disseminate existing guidelines related to evidence-based interventions for conditions and risk factors.
- Disseminate existing evidence-based interventions that address risk factors that can be used in primary care settings (i.e., isotretinoin, alcohol misuse, anti-epileptic drugs, diabetes [preconception], folic acid deficiency, hepatitis B, HIV/AIDS, hypothyroidism, maternal phenylketonuria [PKU], rubella seronegativity, obesity, oral anticoagulant, STD, and smoking).
- Develop fiscal incentives (e.g., pay for performance) for risk management, particularly in managed care settings.
- Apply quality improvement techniques and tools (e.g., conduct rapid improvement cycles, establish benchmarks, use practice self-audits, and participate in quality improvement collaborative groups).

dren, and promising strategies focus on the postpartum period (170). The Health Employer Data and Information Set (HEDIS), used by public and private health plans, has measures for postpartum visits. HEDIS data indicate that 80% of women with private (i.e., commercial) insurance coverage and 55% of those covered by Medicaid receive postpartum check-ups. However, for the majority of health plans, strategies to encourage compliance or address low rates of return for postpartum care have not been implemented (44). Measures for monitoring postpartum visits also are used by a limited number of state Title V Maternal Child Health Block Grant agencies (175). Data collected during postpartum visits typically have not been used to guide health-care system planning.

Approaches to interconception care, which are part of preconception care, have been proposed (176,177), and certain approaches have been tested. For example, in the Interpregnancy Care Program of Grady Memorial Hospital in Atlanta, Georgia, researchers have been studying the effectiveness of interconception care in improving subsequent reproductive outcomes for women who have delivered a baby born at very low birthweight (<1,500 grams). This model focuses on reducing identified medical, dental, and psychosocial risks and assisting women in developing and

achieving their reproductive goals for the future. During the pilot phase, the program identified and treated various medical conditions and reported substantial positive impact on the length of birth intervals (177). The federal Healthy Start program requires that a grantee follow a woman and her child for 2 years postpartum, providing interconception care. In addition, certain Healthy Start grantees provide more in-depth interconception services to women at high risk to reduce future adverse pregnancy outcomes (175). Across the United States, Healthy Start grantees (e.g., the Magnolia Project in northeastern Florida) are providing intensive postpartum case management for women at high risk for adverse pregnancy outcomes (178–179). Opportunities are available to identify, refer, and serve women at high risk in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) nutrition sites, family planning clinics, and home visiting programs (175). Federal and state agencies can support such efforts with funding for demonstration, evaluation, and replication projects (Box 5).

Box 5. Recommendation 5 preconception health action steps

- Monitor the percentage of women who complete postpartum visits (e.g. using the Health Employer Data and Information Set measures for managed care plans and Title V Maternal Child Health Block Grant state measures), and use these data to identify communities of women at risk and opportunities to improve provider follow-up.
- Develop, evaluate, and replicate intensive evidence-based interconception care and care coordination models for women at high social and medical risk.
- Enhance the content of postpartum visits to promote interconception health.
- Use existing public health programs serving women in the postpartum period to provide or link to interventions (e.g., family planning, home visiting, and the Special Supplemental Nutrition Program for Women, Infants, and Children).
- Encourage additional states to develop preconception health improvement projects with funds from the Title V Maternal Child Health Block Grant, Prevention Block Grant, and similar public health programs.

Recommendation 6. Prepregnancy Checkup. Offer, as a component of maternity care, one prepregnancy visit for couples and persons planning pregnancy.

SPPC encourages the use of a broad definition of maternity care that includes the addition of a prepregnancy visit

and the recommended prenatal and postpartum visits. The addition of this prepregnancy visit is an essential step toward improving pregnancy outcomes, particularly for those planning pregnancy.

The Institute of Medicine Panel on Preventing Low Birthweight, the U.S. Public Health Service Expert Panel on the Content of Prenatal Care, and the national Committee on Perinatal Health have recommended that women have a prepregnancy visit (i.e., sometimes called a preconception visit) in the months before conception (1,3,4). Such visits would include preconception care content, providing women an opportunity to benefit from risk assessment, health promotion, and specific interventions related to circumstances when couples are trying to conceive. Adoption of the prepregnancy visit as a standard of care also can help to reinforce the importance of pregnancy planning and preparedness among women and men (Box 6).

Box 6. Recommendation 6 preconception health action steps

- Consolidate existing professional guidelines to develop the recommended content and approach for such a visit.
- Modify third party payer rules to permit payment for one prepregnancy visit per pregnancy, including development of billing and payment mechanisms.
- Educate women and couples regarding the value and availability of prepregnancy planning visits.

Recommendation 7. Health Insurance Coverage for Women with Low Incomes. Increase public and private health insurance coverage for women with low incomes to improve access to preventive women's health and preconception and interconception care.

Affordability of care is a major concern for multiple women (11,180,181), and improved access to preconception care is needed. Approximately 17 million women do not have health insurance, and they are more likely to postpone or forgo care (180). During 2003, one third of women with low incomes, half of women with disabilities, and 18% of all nonelderly (aged <65 years) women did not have health insurance (180). Younger women aged 18–34 years were more likely than older women not to have health insurance during 2003. Reflecting their income and employment status patterns (i.e., more likely to have incomes <200% of poverty level and less likely to be employed in jobs that offer health insurance), non-Hispanic white, Asian, and non-Hispanic black women were more likely than non-Hispanic white women not to have health insurance (11,180,181).

Medicaid is the primary mechanism for extending health coverage to women with low incomes and who do not have health insurance. During 2003, a total of 12% of all women of childbearing age and 37% of women with low incomes in that age group relied on Medicaid for health-care coverage (181,182). Medicaid has been demonstrated to be effective in improving access to health care for women with low incomes (179). Because nearly two thirds (63%) of women covered by Medicaid are of childbearing age, the program's performance is related to preconception care access and to the outcomes of pregnancy (183). Many women with low incomes, however, do not qualify for Medicaid because they do not have children aged <18 years or do not have documentation of legal residence in the United States. As states seek to expand Medicaid coverage to persons with low incomes and adults who do not have health insurance, women of childbearing age should receive priority for qualifying for Medicaid coverage.

Since 1995, a total of 22 states have used their federal waiver authority to expand family planning services to women who do not otherwise qualify for Medicaid, known as family planning waivers. Certain states offer coverage to women who lose coverage after the birth of a baby or starting a job, whereas other states offer family planning coverage based on the income status of men and women (182). An evaluation of these family planning waiver projects prepared for the federal Center for Medicare and Medicaid Services indicated that the projects resulted in substantial savings to both the federal and state governments (184). Increased potential savings and prevention, however, can result if states provided coverage for more comprehensive risk screening, health promotion, and interventions, resulting in higher levels of preconception wellness (Box 7).

Box 7. Recommendation 7 preconception health action steps

- Improve the design of family planning waivers by permitting states (by federal waiver or by creating a new state option) to offer interconception risk assessment, counseling, and interventions along with family planning services. Such policy developments would create new opportunities to finance interconception care.
- Increase health coverage among women who have low incomes and are of childbearing age by using federal options and waivers under public and private health insurance systems and the State Children's Health Insurance Program.
- Increase access to health-care services through policies and reimbursement levels for public and private health insurance systems to include a full range of clinicians who care for women.

Recommendation 8. Public Health Programs and Strategies. Integrate components of preconception health into existing local public health and related programs, including emphasis on interconception interventions for women with previous adverse outcomes.

Public health programs serve millions of women each year. Preconception interventions can be incorporated into these programs to target women at highest risk. Title X family planning programs provide approximately 4.6 million women with family planning education and contraceptives and pregnancy tests. However, a limited number of programs offer more comprehensive risk screening, reproductive health promotion, and reproductive life planning (185). Each year, WIC provides nutrition screening and counseling, supplemental food, and referrals to health services for approximately 8 million women during pregnancy and the postpartum period (186). These services provide an opportunity to promote preconception health and refer women at risk to clinicians. Federal and state public health programs funded by the Title V Maternal and Child Health Services Block Grant and CDC can give greater priority to preconception health and offer support for demonstration projects and evaluations of prevention programs. Whereas federally funded Healthy Start projects are required to have interconception health activities, these projects, located in communities with high infant mortality, provide opportunities to offer more systematic preconception screening, health promotion, and interventions. Publicly funded programs that offer screening and related services for STDs and HIV/AIDS also might provide risk assessment and health promotion interventions. Title X, WIC, Title V, Healthy Start, and other public health programs also provide a setting to test and evaluate new approaches to improve preconception health (44,187).

Strategies to promote dialogue and action among community members for a geographically defined community or a community of professionals can help advance these recommendations and action steps (Box 8). Local task force groups that involve consumer, community leaders, and health professionals can help implement preconception strategies that are similar to strategies used previously for other topics (e.g., adolescent pregnancy prevention and childhood vaccinations). Functioning parallel to clinical practice collaboratives, public health practice collaboratives that link local public health programs can promote development and dissemination of community-based best practices.

Recommendation 9. Research. Increase the evidence base and promote the use of the evidence to improve preconception health.

Box 8. Recommendation 8 preconception health action steps

- Use federal and state agency support to encourage more integrated preconception health practices in clinics and programs.
- Provide support for CDC programs to develop, evaluate, and disseminate integrated approaches to promote preconception health.
- Analyze and evaluate the preconception care activities used under the federal Healthy Start program, and support replication projects.
- Convene or use local task forces, coalitions, or committees to discuss opportunities for promotion and prevention in preconception health at the community level.
- Develop and support public health practice collaborative groups to promote shared learning and dissemination of approaches for increasing preconception health.
- Include content related to preconception care in educational curricula of schools of public health and other training facilities for public health professionals.

Additional evidence is needed regarding the effectiveness of interventions, the value of better service integration, and the potential cost benefit of preconception care for the general population and for women at high risk for poor pregnancy outcomes. Evaluations of preconception health programs and projects can help advance understanding of the potential impact of selected approaches. For certain clinical interventions (e.g., interventions to address multiple risk factors simultaneously or single risk factor interventions), randomized clinical trials are warranted, although not all preconception health interventions can be ethically tested in this manner. Economic studies, particularly of clinical intervention strategies, can support the case for wider dissemination of preconception care practices (188; Box 9).

Recommendation 10. Monitoring Improvements. Maximize public health surveillance and related research mechanisms to monitor preconception health.

Community health data are used systematically to conduct public health surveillance to evaluate and improve health, health programs, and health policy (187). Surveillance includes monitoring the frequency of conditions, risk factors, services, and outcomes. CDC and other public health agencies conduct surveillance and maintain data collection and surveillance systems, and the field of maternal and child health benefits from several of these systems. For example, PRAMS, the Behavioral Risk Factor Surveillance System, and the National Survey of Family Growth (NSFG) can be modified to provide more data concerning preconception health (189–

Box 9. Recommendation 9 preconception health action steps

- Prepare an updated evidence-based systematic review of all published reports on science, programs, and policy (e.g., through the Agency for Healthcare Research and Quality).
- Encourage and support evaluation of model programs and projects, including integrated service delivery and community health promotion projects.
- Conduct quantitative and qualitative studies to advance knowledge of preconception risks and clinical and public health interventions, including knowledge of more integrated practice strategies and interconception approaches.
- Design and conduct analyses of cost-benefit and cost-effectiveness as part of the study of preconception interventions.
- Conduct health services research to explore barriers to evidence-based and guidelines-based practice.
- Conduct studies to examine the factors that results in variations in individual use of preconception care (i.e., barriers and motivators that affect health-care use).

191). At the state and local levels, PRAMS, Perinatal Periods of Risk, Fetal-Infant Mortality Review, and youth risk behavior surveys provide additional opportunities for the data collection, analysis, and interpretation that comprise public health surveillance (190, 192–194).

The Maternal and Child Health Bureau, in cooperation with states, operates the Title V data and information system, which provides an opportunity to strengthen public health surveillance and performance monitoring. A review of state-selected performance measures and priority needs for 2006–2010 indicated that a limited number of states are monitoring trends for access to components of preconception and interconception care, access to primary care for women of childbearing age, unintended pregnancy, and other related topics (175).

Since 1990, indicators and monitoring systems have been used not only to assess programs at the population level but also to measure the quality of health-care services. HEDIS is an example of a set of measures commonly used by purchasers of health-care coverage, including state Medicaid agencies and employers. HEDIS includes indicators on prenatal and postpartum care and family planning (195). New HEDIS measures are needed to monitor access to, use of, and outcomes of preconception care services as well as improved maternal and infant health. The recommendations in this report can be used as a frame work for developing or modifying

existing measures to monitor evidence-based interventions used in preconception health services (Box 10).

Box 10. Recommendation 10 preconception health action steps

- Apply public health surveillance strategies to monitor selected preconception health indicators (e.g., folic acid supplementation, smoking cessation, alcohol misuse, diabetes, and obesity).
- Expand data systems and surveys (e.g., the Pregnancy Risk Assessment and Monitoring System and the National Survey of Family Growth) to monitor individual experiences related to preconception care.
- Use geographic information system techniques to target preconception health programs and interventions to areas where high rates of poor health outcomes exist for women of reproductive age and their infants.
- Use analytic tools (e.g., Perinatal Periods of Risk) to measure and monitor the proportion of risk attributable to the health of women before pregnancy.
- Include preconception, interconception, and health status measures in population-based performance monitoring systems (e.g., in national and state Title V programs).
- Include a measure of the delivery of preconception care services in the *Healthy People 2020* objectives.
- Develop and implement indicator quality improvement measures for all aspects of preconception care. For example, use the Health Employer Data and Information Set measures to monitor the percentage of women who complete preconception care and postpartum visits or pay for performance measures.

Conclusion

The 10 recommendations for improving preconception care services and the health of women and infants were developed through a process of consultation with a select panel of specialists from the relevant disciplines. Implementation of the recommendations will help achieve the SPPC vision of preconception health and pregnancy outcomes in which 1) women and men of childbearing age have high reproductive awareness (i.e., understand risk factors related to childbearing); 2) women and men have a reproductive life plan (e.g., whether or when they want to have children and how they will maintain their reproductive health); 3) pregnancies are intended and planned; 4) women and men of childbearing age have health-care coverage; 5) women of childbearing age are screened before pregnancy for risks related to the outcomes of pregnancy; and 6) women with a previous adverse preg-

nancy outcome (e.g., infant death, very low birthweight or preterm birth) have access to interconception care aimed at reducing their risks.

Improving preconception health will require changes in the knowledge and attitudes and behaviors of persons, families, communities, and institutions (e.g., government and health-care settings). The purpose of preconception care is to improve the health of each woman before any pregnancy and thereby affect the future health of the woman, her child, and her family. The recommendations and specific action steps were developed as a result of SPPC meeting and implementation of CDC's preconception health programs. The framework has incorporated both an ecological model and a lifespan perspective on health and recognized the unique contributions and challenges encountered by women, their families, communities, and institutions. Improving the health of women can increase the quality of health for families and the community.

Several preconception care interventions have reduced risk and improved health outcomes. By increasing support for provision of preconception care, policy makers have the opportunity to promote broad-based programs and services aimed at improving the health of women, children, and families. The recommendations present a conceptual framework for innovative service delivery models so that women are afforded the benefit of risk-appropriate preconception services during every encounter with the health-care system.

References

1. Institute of Medicine. Preventing low birth weight. Washington, DC: National Academy Press; 1985.
2. Moos MK, Cefalo RC. Preconceptional health promotion: a focus for obstetric care. *Am J Perinatol* 1987;4:63-7.
3. Committee on Perinatal Health. Toward improving the outcome of pregnancy: recommendations of the Regional Development of Maternal and Perinatal Health Service—the 90s and beyond. White Plains, NY: March of Dimes, National Foundation; 1993.
4. US Department of Health and Human Services. Caring for our future: the content of prenatal care: a report of the Public Health Service Expert Panel on the Content of Prenatal Care. Washington, DC: US Department of Health and Human Services, Public Health Service; 1989.
5. Jack BW, Culpepper L. Preconception care: risk reduction and health promotion in preparation for pregnancy. *JAMA* 1990;264:1147-9.
6. Jack BW, Culpepper L. Preconception care. *J Fam Pract* 1991;32:306-15.
7. Cefalo RC, Moos MK. Preconceptional health promotion. In: *Preconceptional health care: a practical guide*. 2nd ed. St. Louis, MO: Mosby; 1995.
8. Atrash HK, Johnson K, Adams M, Cordero JF, Howse J. Time to act on missed opportunities to improve perinatal outcomes: preconception care. *Matern Child Health J*. In press 2006.

9. US Census Bureau Population Division. Table 2: annual estimates of the population by selected age groups and sex for the United States: April 1, 2000, to July 1, 2004. Washington, DC: US Census Bureau, Population Division; 2005. (NC-EST) 2004-02.
10. Martin JA, Hamilton BE, Sutton PD, Ventura SJ, Menacker F, Munson ML. Births: final data for 2003. *Natl Vital Stat Rep* 2005;54:1-116.
11. Salganicoff A, Ranji U, Wyn R. Women and health care: a national profile—key findings from the Kaiser Women's Health Survey. Menlo Park, CA: Kaiser Family Foundation; 2005. Available at <http://www.kff.org/womenshealth/upload/Women-and-Health-Care-A-National-Profile-Key-Findings-from-the-Kaiser-Women-s-Health-Survey.pdf>.
12. Weisman CS. Women's use of health care. In: Falik M, Collins K, eds. *Women's health: the Commonwealth Fund Survey of Women's Health*. Baltimore, MD: Johns Hopkins University Press; 1996.
13. Henderson JT, Weisman CS, Grason H. Are two doctors better than one? Women's physician use and appropriate care. *Women's Health Issues* 2002;12:139-49.
14. Klerman LV, Reynolds DW. Interconception care: a new role for the pediatrician. *Pediatrics* 1994;93:327-9.
15. National Association of Community Health Centers. A nation's health at risk II: a front row seat in a changing health care system, 2004. Washington, DC: National Association of Community Health Centers; Special Topics Issues Brief No. 7.
16. Allaire AD, Cefalo RC. Preconceptional health care model. *Eur J Obstet Gynecol Reprod Biol* 1998;78:163-8.
17. Lu MC, Halfon N. Racial and ethnic disparities in birth outcomes: a life-course perspective. *Matern Child Health J* 2003;7:13-30.
18. US National Library of Medicine. PubMed[®]. Washington, DC: US National Library of Medicine; 2006. Available at <http://www.pubmed.gov>.
19. American College of Obstetricians and Gynecologists. Access to women's health care: ACOG statement of policy. Washington, DC: American College of Obstetricians and Gynecologists; 2003.
20. Misra DP, Guyer B, Allston A. Integrated perinatal health framework: a multiple determinants model with a life span approach. *Am J Prev Med* 2003;25:65-75.
21. Cheng D. Preconception health care for the primary care practitioner. *Md Med J* 1996;45:297-304.
22. Hobbins D. Prepping for healthy moms & babies: making the case for preconception care & counseling. *AWHONN Lifelines* 2001;5:49-54.
23. Frey KA. Preconception care by the nonobstetrical provider. *Mayo Clin Proc* 2002;77:469-73.
24. Moos MK. Preconceptional health promotion: opportunities abound. *Matern Child Health J* 2002;6:71-3.
25. Moos MK. Preconceptional wellness as a routine objective for women's health care: an integrative strategy. *J Obstet Gynecol Neonatal Nurs* 2003;32:550-6.
26. Moos MK. Preconceptional health promotion: progress in changing a prevention paradigm. *J Perinat Neonatal Nurs* 2004;18:2-13.
27. Reynolds HD. Preconception care: an integral part of primary care for women. *J Nurse Midwifery* 1998;43:445-58.
28. Weisman CS. Changing definitions of women's health: implications for health care and policy. *Matern Child Health J* 1997;1:179-89.
29. Clancy CM, Massion CT. American women's health care: a patchwork quilt with gaps. *JAMA* 1992;268:1918-20.
30. American College of Obstetricians and Gynecologists. *Guidelines for women's health care*. 2nd ed. Washington, DC: American College of Obstetricians and Gynecologists; 1996.
31. American Academy of Pediatrics, American College of Obstetricians and Gynecologists. *Guidelines for perinatal care*. 5th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2002. Washington, DC: American College of Obstetricians and Gynecologists; 2002.
32. Hobbins D. Preconception care: maximizing the health of women and their newborns: Association of Women's Health Obstetric and Neonatal Nurses practice monograph. Washington, DC: Association of Women's Health Obstetric and Neonatal Nurses; 2001.
33. American College of Obstetricians and Gynecologists Preconception Work Group. The importance of preconception care in the continuum of women's health care. *Obstet Gynecol* 2005;106:665-6.
34. Roth LK, Taylor HS. Risks of smoking to reproductive health: assessment of women's knowledge. *Am J Obstet Gynecol* 2001;184:934-9.
35. Kaiser Family Foundation. Summary of findings from a new Public Knowledge and Attitudes Survey on sexually transmitted diseases (STDs). Washington, DC: Kaiser Family Foundation; 1996. Available at <http://www.kff.org/youthhivstds/1206-stdrel.cfm>.
36. US Department of Health and Human Services. *Healthy People 2000: national health promotion and disease prevention objectives—full report, with commentary*. Washington, DC: US Department of Health and Human Services, Public Health Service; 1991. (DHHS) 91-502212.
37. US Department of Health and Human Services. *Healthy People 2010*. 2nd ed. Vol. I. Washington, DC: US Department of Health and Human Services; 2000.
38. US Department of Health and Human Services. *Healthy People 2010*. 2nd ed. Vol II. Washington, DC: US Department of Health and Human Services; 2000.
39. March of Dimes Birth Defects Foundation. March of Dimes updates: is early prenatal care too late? *Contemporary Ob/Gyn* 2002;12:54-72.
40. Fowler JR, Jack BW. Preconception care. In: Taylor RB, David AK, Fields SA, Phillips DM, Scherger JE, eds. *Family medicine principles and practice*. 6th ed. New York, NY: Springer; 2003:85-94.
41. Brundage SC. Preconception health care. *Am Fam Physician* 2002;65:2507-14.
42. Mosca L, Appel LJ, Benjamin EJ, et al. Evidence-based guidelines for cardiovascular disease prevention in women: American Heart Association scientific statement. *Arterioscler Thromb Vasc Biol* 2004;24:e29-e50.
43. Korenbrot CC, Steinberg A, Bender C, Newberry S. Preconception care: a systematic review. *Matern Child Health J* 2002;6:75-88.
44. US Department of Health and Human Services. *Women's health USA*. Rockville, MD: US Department of Health and Human Services, Health Resources and Services Administration; 2005.
45. CDC. Alcohol consumption among women who are pregnant or who might become pregnant—United States, 2002. *MMWR* 2004;53:1178-81.
46. CDC. Revised recommendations for HIV screening of pregnant women. *MMWR* 2001;50(No. RR-19):63-85.
47. Adams MM, Bruce FC, Shulman HB, Kendrick JS, Brogan DJ. Pregnancy planning and pre-conception counseling: the PRAMS Working Group. *Obstet Gynecol* 1993;82:955-9.

48. Hellerstedt WL, Pirie PL, Lando HA, et al. Differences in preconceptional and prenatal behaviors in women with intended and unintended pregnancies. *Am J Public Health* 1998;88:663–6.
49. CDC. Control and prevention of rubella: evaluation and management of suspected outbreaks, rubella in pregnant women, and surveillance for congenital rubella syndrome. *MMWR* 2001;50(No. RR-12):1–23.
50. Czeizel AE, Dudas I. Prevention of the first occurrence of neural-tube defects by periconceptional vitamin supplementation. *N Engl J Med* 1992;327:1832–5.
51. Czeizel AE, Toth M, Rockenbauer M. Population-based case control study of folic acid supplementation during pregnancy. *Teratology* 1996;53:345–51.
52. Werler MM, Shapiro S, Mitchell AA. Periconceptional folic acid exposure and risk of occurrent neural tube defects. *JAMA* 1993;269:1257–61.
53. Moore KL, Persaud TVN. *The developing human: clinically oriented embryology*. 5th ed. Philadelphia, PA: W.B. Saunders; 1993.
54. Floyd RL, Decoufle P, Hungerford DW. Alcohol use prior to pregnancy recognition. *Am J Prev Med* 1999;17:101–7.
55. Hanson J, Streissguth AP, Smith DW. The effects of moderate alcohol consumption during pregnancy on fetal growth and morphogenesis. *J Pediatr* 1978;92:457–60.
56. Daniel KL, Honein MA, Moore CA. Sharing prescription medication among teenage girls: potential danger to unplanned/undiagnosed pregnancies. *Pediatrics* 2003;111(5 Part 2):1167–70.
57. Botto LD, Moore CA, Khoury MJ, Erickson JD. Neural-tube defects. *N Engl J Med* 1999;341:1509–19.
58. Andres RL, Day MC. Perinatal complications associated with maternal tobacco use. *Semin Neonatol* 2000;5:231–41.
59. Haas JS, Meneses V, McCormick MC. Outcomes and health status of socially disadvantaged women during pregnancy. *J Womens Health Gend Based Med* 1999;8:547–53.
60. Adler NE, Newman K. Socioeconomic disparities in health: pathways and policies. *Health Aff* 2002;21:60–76.
61. Huynh M, Parker JD, Harper S, Pamuk E, Schoendorf KC. Contextual effect of income inequality on birth outcomes. *Int J Epidemiol* 2005;34:888–95.
62. Institute of Medicine. *Unequal treatment: confronting racial and ethnic disparities in health care*. In: Smedley BD, Stith AY, Nelson AR, eds. Washington, DC: National Academy Press; 2002.
63. Krieger N, Rowley DL, Herman AA, Avery B, Phillips MT. Racism, sexism, and social class: implications for studies of health, disease, and well-being. *Am J Prev Med* 1993;9:82–122.
64. Jones CP. Levels of racism: a theoretic framework and a gardener's tale. *Am J Public Health* 2000;90:1212–5.
65. CDC. Accutane-exposed pregnancies—California, 1999. *MMWR* 2000;49:28–31.
66. Perlman SE, Rudy SJ, Pinto C, Townsend-Akpan C. Caring for women with childbearing potential taking teratogenic dermatologic drugs: guidelines for practice. *J Reprod Med* 2001;46:153–61.
67. Perlman SE, Leach EE, Dominguez L, Ruszkowski AM, Rudy SJ. Be smart, be safe, be sure: the revised Pregnancy Prevention Program for Women on Isotretinoin. *J Reprod Med* 2001;46:179–85.
68. CDC. National Task Force on Fetal Alcohol Syndrome and Fetal Alcohol Effect: defining the national agenda for fetal alcohol syndrome and other prenatal alcohol-related effects. *MMWR* 2002;51(No. RR-14):9–12.
69. US Preventive Services Task Force. Screening and behavioral counseling interventions in primary care to reduce alcohol misuse: recommendation statement. *Ann Intern Med* 2004;140:554–6.
70. Whitlock EP, Polen MR, Green CA, Orleans T, Klein J. Behavioral counseling interventions in primary care to reduce risky/harmful alcohol use by adults: a summary of the evidence for the US Preventive Services Task Force. *Ann Intern Med* 2004;140:557–68.
71. American College of Obstetricians and Gynecologists. Substance abuse in pregnancy. *Int J Gynaecol Obstet* 1994;47:73–80.
72. Institute of Medicine, Stratton K, Howe C, Battaglia FC, eds. *Committee to Study Fetal Alcohol Syndrome: fetal alcohol syndrome—diagnosis, epidemiology, prevention and treatment*. Washington, DC: National Academy Press; 1996.
73. Institute of Medicine, Bonnie RJ, O'Connell ME, eds. *Committee on Developing a Strategy to Reduce and Prevent Underage Drinking: reducing underage drinking—a collective responsibility*. Washington, DC: National Academy Press; 2004.
74. American College of Obstetricians and Gynecologists. Seizure disorders in pregnancy. *Int J Gynec Obstet* 1997;56:279–86.
75. Barrett C, Richens A. Epilepsy and pregnancy: report of an Epilepsy Research Foundation Workshop. *Epilepsy Res* 2003;52:147–87.
76. Crawford P, Appleton R, Betts T, Duncan J, Guthrie E, Morrow J. Best practice guidelines for the management of women with epilepsy: the Women with Epilepsy Guidelines Development Group. *Seizure* 1999;8:201–17.
77. American Academy of Neurology. Practice parameter: management issues for women with epilepsy (summary statement): report of the Quality Standards Subcommittee of the American Academy of Neurology. *Neurology* 1998;51:944–8.
78. Morrell MJ. Guidelines for the care of women with epilepsy. *Neurology* 1998;51(5 Suppl 4):S21–S27.
79. American Diabetes Association. Preconceptional care of women with diabetes. *Diabetes Care* 2004;27(Suppl 1):S76–S78.
80. Kitzmiller JL, Buchanan TA, Kjos S, Combs CA, Ratner RE. Preconception care of diabetes, congenital malformations, and spontaneous abortions. *Diabetes Care* 1996;19:514–41.
81. American College of Obstetricians and Gynecologists. Diabetes and pregnancy [Technical bulletin]. *Int J Gynaecol Obstet* 1995;48:31–9.
82. Roland JM, Murphy HR, Ball V, Northcote-Wright J, Temple RC. The pregnancies of women with Type 2 diabetes: poor outcomes but opportunities for improvement. *Diabet Med* 2005;22:1774–7.
83. CDC. Recommendations for the use of folic acid to reduce the number of cases of spina bifida and other neural tube defects. *MMWR* 1992;41(No. RR-14):1–7.
84. US Department of Health and Human Services. Screening for neural tube defects. In: *Guide to clinical preventive services*. 2nd ed. Washington, DC: US Department of Health and Human Services, US Preventive Services Task Force; 1996:473–6.
85. American College of Obstetricians and Gynecologists. Clinical management guidelines for obstetrician-gynecologists. *Obstet Gynecol* 2003;102:203–13.
86. American College of Obstetricians and Gynecologists. Folic acid for the prevention of recurrent neural tube defects: Committee on Obstetrics—maternal and fetal medicine. *Int J Gynaecol Obstet* 1993;42:75–7.

87. Institute of Medicine Food and Nutrition Board. Dietary reference intakes for thiamin, riboflavin, niacin, vitamin B6, folate, vitamin B12, pantothenic acid, biotin, and choline. Washington, DC: National Academy Press; 1999.
88. Lumley J, Watson L, Watson M, Bower C. Periconceptional supplementation with folate and/or multivitamins for preventing neural tube defects. *Cochrane Database Syst Rev* 2001;(3):CD001056.
89. CDC. Hepatitis B vaccination—United States, 1982–2002. *MMWR* 2002;51:549–52, 563.
90. Gunn RA, Lee MA, Callahan DB, Gonzales P, Murray PJ, Margolis HS. Integrating hepatitis, STD, and HIV services into a drug rehabilitation program. *Am J Prev Med* 2005;29:27–33.
91. CDC. A comprehensive immunization strategy to eliminate the transmission of hepatitis B virus infection in the United States. Recommendations of the Advisory Committee on Immunization Practices (ACIP) part I—immunization of infants, children, and adolescents. *MMWR* 2005;54(No. RR-16):1–23.
92. American College of Obstetricians and Gynecologists. Human immunodeficiency virus infections in pregnancy. *Int J Gynaecol Obstet* 1997;57:73–80.
93. American College of Obstetricians and Gynecologists. Human immunodeficiency virus: ethical guidelines for obstetricians and gynecologists. *Obstet Gynecol* 2001;97(Suppl 1–6).
94. Institute of Medicine. Reducing the odds: preventing perinatal transmission of HIV in the United States. Washington, DC: National Academy Press; 1999.
95. Institute of Medicine. IOM: make prenatal HIV testing part of routine care. *AIDS Alert* 1998;13:137–8.
96. Brocklehurst P, Volmink J. Antiretrovirals for reducing the risk of mother-to-child transmission of HIV infection. *Cochrane Database Syst Rev* 2002;(1):CD003510.
97. CDC. U.S. Public Health Service Task Force recommendations for use of antiretroviral drugs in pregnant HIV-1-infected women for maternal health and interventions to reduce perinatal HIV-1 transmission in the United States. *MMWR* 2002;51(No. RR-18):1–38.
98. Helfand M. Screening for subclinical thyroid dysfunction in non-pregnant adults: a summary of the evidence for the US Preventive Services Task Force. *Ann Intern Med* 2004;140:128–41.
99. American College of Obstetricians and Gynecologists. Clinical management guidelines for obstetrician-gynecologists: thyroid disease in pregnancy. *Obstet Gynecol* 2002;100:387–96.
100. American Association of Clinical Endocrinologists. Medical guidelines for clinical practice for the evaluation and treatment of hyperthyroidism and hypothyroidism. *Endocr Pract* 2002;8:457–69.
101. National Institutes of Health. Phenylketonuria screening and management. Vol. 17, no. 3. Presented at the National Institutes of Health Consensus Conference, Bethesda, MD; October 16–18, 2000.
102. American College of Obstetricians and Gynecologists Committee on Genetics. Maternal phenylketonuria. *Int J Gynecol Obstet* 2001;72:83–4.
103. US Department of Health and Human Services. Screening for rubella. In: *Guide to clinical preventive services*. 2nd ed. Washington, DC: US Department of Health and Human Services, US Preventive Services Task Force; 1996.
104. American College of Obstetricians and Gynecologists. Rubella vaccination. *Int J Gynaecol Obstet* 2003;81:241.
105. US Department of Health and Human Services. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: the evidence report. Bethesda, MD: US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Heart, Lung, and Blood Institute Obesity Education Initiative; 1998. (NIH) 98-4083.
106. McTigue KM, Harris R, Hemphill B, et al. Screening and interventions for obesity in adults: summary of the evidence for the U.S. Preventive Services Task Force. *Ann Intern Med* 2003;139:933–49.
107. Kramer MS. Energy/protein restriction for high weight-for-height or weight gain during pregnancy. *Cochrane Database Syst Rev* 2000;(2):CD000080.
108. Institute of Medicine. Nutrition during pregnancy: part I: weight gain. Washington, DC: National Academy Press; 1990.
109. Nawaz H, Katz DL. American College of Preventive Medicine Practice Policy statement. Weight management counseling of overweight adults. *Am J Prev Med* 2001;21:73–8.
110. American College of Obstetricians and Gynecologists Committee on Practice Bulletins. Obstetrics: thrombembolism in pregnancy. *Int J Gynaecol Obstet* 2001;75:203–12.
111. Ressel GW. ACOG practice bulletin on preventing deep venous thrombosis and pulmonary embolism. *Am Fam Physician* 2001;63:2279–80.
112. Hirsh J, Fuster V, Ansell J, Halperin JL. American Heart Association/American College of Cardiology Foundation guide to warfarin therapy. *J Am Coll Cardiol* 2003;41:1633–52.
113. CDC. *Chlamydia trachomatis* genital infections—United States, 1995. *MMWR* 1997;46:193–8.
114. CDC. Gonorrhea—United States, 1998. *MMWR* 2000;49:538–42.
115. US Department of Health and Human Services. Clinical practice guidelines: treating tobacco use and dependence. Washington, DC: US Department of Health and Human Services, Public Health Service; 2000.
116. US Preventive Services Task Force. Counseling to prevent tobacco use and tobacco-caused disease: recommendation statement. Rockville, MD: US Preventive Services Task Force, Agency for Healthcare Research and Quality; 2003.
117. Hopkins DP, Briss PA, Ricard CJ, et al. Reviews of evidence regarding interventions to reduce tobacco use and exposure to environmental tobacco smoke. *Am J Prev Med* 2001;20(Suppl 2):16–66.
118. American College of Obstetricians and Gynecologists. Smoking cessation during pregnancy. *Obstet Gynecol* 2005;106:883–8.
119. Institute of Medicine. The best intentions: unintended pregnancy and the well-being of children and infants. Washington, DC: National Academy Press; 1995.
120. Henshaw SK. Unintended pregnancy in the United States. *Fam Plann Perspect* 1998;30:24–9, 46.
121. Moos MK, Bangdiwala SI, Meibohm AR, Cefalo RC. The impact of a preconceptional health promotion program on intendedness of pregnancy. *Am J Perinatol* 1996;13:103–8.
122. Medical Research Council Vitamin Study Research Group. Prevention of neural tube defects: results of the Medical Research Council Vitamin Study—MRC Vitamin Study Research Group. *Lancet* 1991;338:131–7.
123. Williams LJ, Rasmussen SA, Flores A, Kirby RS, Edmonds LD. Decline in the prevalence of spina bifida and anencephaly by race/ethnicity: 1995–2002. *Pediatrics* 2005;116:580–6.

124. Robbins JM, Cleves MA, Collins HB, Andrews N, Smith LN, Hobbs CA. Randomized trial of a physician-based intervention to increase the use of folic acid supplements among women. *Am J Obstet Gynecol* 2005;192:126–32.
125. Wald NJ, Bower C. Folic acid and the prevention of neural tube defects. *BMJ* 1995;310:1019–20.
126. McElvy SS, Miodovnik M, Rosenn B, et al. A focused preconceptional and early pregnancy program in women with type 1 diabetes reduces perinatal mortality and malformation rates to general population levels. *J Matern Fetal Med* 2000;9:14–20.
127. Kitzmiller JL, Gavin LA, Gin GD, Jovanovic-Peterson L, Main EK, Zigrang WD. Preconception care of diabetes: glycemic control prevents congenital anomalies. *JAMA* 1991;265:731–6.
128. Jovanovic L, Nakai Y. Successful pregnancy in women with type 1 diabetes: from preconception through postpartum care. *Endocrinol Metab Clin North Am* 2006;35:79–97.
129. Ray JG, O'Brien TE, Chan WS. Preconception care and the risk of congenital anomalies in the offspring of women with diabetes mellitus: a meta-analysis. *QJM* 2001;94:435–44.
130. Diabetes Control and Complications Trial Research Group. Pregnancy outcomes in the Diabetes Control and Complications Trial. *Am J Obstet Gynecol* 1996;174:1343–53.
131. Willhoite MB, Bennert HW Jr, Palomaki GE, et al. The impact of preconception counseling on pregnancy outcomes: the experience of the Maine Diabetes in Pregnancy Program. *Diabetes Care* 1993;16:450–5.
132. Koch R, Wenz E, Bauman C, et al. Treatment outcome of maternal phenylketonuria. *Acta Paediatr Jpn* 1988;30:410–6.
133. Brenton DP, Tarn AC, Cabrera-Abreu JC, Lilburn M. Phenylketonuria: treatment in adolescence and adult life. *Eur J Pediatr* 1996;155(Suppl 1):S93–S96.
134. Cipicic-Schmidt S, Trefz FK, Funders B, Seidlitz G, Ullrich K. German Maternal Phenylketonuria Study. *Eur J Pediatr* 1996;155(Suppl 1):S173–S176.
135. Lumley J, Oliver SS, Chamberlain C, Oakley L. Interventions for promoting smoking cessation during pregnancy. *Cochrane Database Syst Rev* 2004;(4):CD001055.
136. Ma Y, Goins KV, Pbert L, Ockene JK. Predictors of smoking cessation in pregnancy and maintenance postpartum in low-income women. *Matern Child Health J* 2005;12:1–10.
137. Floyd RL, O'Connor MJ, Sokol RJ, Bertrand J, Cordero JF. Recognition and prevention of fetal alcohol syndrome. *Obstet Gynecol* 2005;106:1059–64.
138. Floyd RL, Ebrahim SH, Boyle CA, Gould DW. Observations from the CDC: preventing alcohol-exposed pregnancies among women of childbearing age: the necessity of a preconceptional approach. *J Womens Health Gend Based Med* 1999;8:733–6.
139. Ingersoll K, Floyd L, Sobell M, Velasquez MM. Reducing the risk of alcohol-exposed pregnancies: a study of a motivational intervention in community settings. *Pediatrics* 2003;111:1131–5.
140. Lopez NJ, Smith PC, Gutierrez J. Periodontal therapy may reduce the risk of preterm low birth weight in women with periodontal disease: a randomized controlled trial. *J Periodontol* 2002;73:911–24.
141. Offenbacher S, Jared HL, O'Reilly PG, et al. Potential pathogenic mechanisms of periodontitis: associated pregnancy complications. *Ann Periodontol* 1998;3:233–50.
142. Jarjoura K, Devine PC, Perez-Delboy A, Herrera-Abreu M, D'Alton M, Papananou PN. Markers of periodontal infection and preterm birth. *Am J Obstet Gynecol* 2005;192:513–9.
143. CDC. Surveillance for dental caries, dental sealants, tooth retention, edentulism, and enamel fluorosis—United States, 1988–1994 and 1999–2002. In: *Surveillance Summaries*, August 26, 2005. *MMWR* 2005;54(No. SS-3).
144. Woolf SH, Atkins D. The evolving role of prevention in health care: contributions of the U.S. Preventive Services Task Force. *Am J Prev Med* 2001;20(Suppl 3):13–20.
145. Whitlock EP, Orleans CT, Pender N, Allan J. Evaluating primary care behavioral counseling interventions: an evidence-based approach. *Am J Prev Med* 2002;22:267–84.
146. Starfield B. *Primary care: balancing health needs, services, and technology*. New York, NY: Oxford University Press; 1998.
147. Czeizel AE. Ten years of experience in periconceptional care. *Eur J Obstet Gynecol Reprod Biol* 1999;84:43–9.
148. Jack BW, Culpepper L, Babcock J, Kogan MD, Weismiller D. Addressing preconception risks identified at the time of a negative pregnancy test: a randomized trial. *J Fam Pract* 1998;47:33–8.
149. Bernstein PS, Sanghvi T, Merkatz IR. Improving preconception care. *J Reprod Med* 2000;45:546–52.
150. American Academy of Pediatrics. *Guidelines for health supervision, III*. Elk Grove Village, IL: American Academy of Pediatrics; 1997.
151. Anderson RT, Weisman CS, Scholle SH, Henderson JT, Oldendick R, Camacho F. Evaluation of the quality of care in the clinical care centers of the National Centers of Excellence in Women's Health. *Womens Health Issues* 2002;12:309–26.
152. CDC. Strategies for reducing morbidity and mortality from diabetes through health-care system interventions and diabetes self-management education in community settings. A report on recommendations of the Task Force on Community Preventive Services. *MMWR* 2001;50(No. RR-16):1–15.
153. Rogers E. *Diffusion of innovations*. 3rd ed. New York, NY: Free Press; 1983.
154. Berwick DM. Disseminating innovations in health care. *JAMA* 2003;289:1969–75.
155. National Center for Health Statistics. *Health, United States, 2005, with chartbook on trends in the health of Americans*. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2005.
156. Agrey N, Crowe K, Levitt C, MacDonald J, MacLean D, Polomeno V. Preconception care. In: Hanvey L, ed. *Family-centered maternity and newborn care*. Ottawa, Ontario, Canada: Minister of Public Works and Government Services; 2005:3.1–3.29.
157. Card JJ. Teen pregnancy prevention: do any programs work? *Annu Rev Public Health* 1999;20:257–85.
158. CDC. Ten great public health achievements—United States, 1900–1999. *MMWR* 1999;48:241–3.
159. Andreasen A. *Marketing and social change: changing behavior to promote health, social development, and the environment*. San Francisco, CA: Josey Bass; 1995.
160. Andreasen A. Marketing social marketing in the social change marketplace. *J Public Policy Marketing* 2002;21:3–13.
161. Rodgers BD, Rodgers DE. Efficacy of preconception care of diabetic women in a community setting. *J Reprod Med* 1996;41:422–6.

162. Grol R. Improving the quality of medical care: building bridges among professional pride, payer profit, and patient satisfaction. *JAMA* 2001;286:2578–85.
163. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness. *JAMA* 2002;288:1775–9.
164. Ozer EM, Adams SH, Lustig JL, et al. Increasing the screening and counseling of adolescents for risky health behaviors: a primary care intervention. *Pediatrics* 2005;115:960–8.
165. Maternal and Child Health Bureau and American Academy for Pediatrics. *Bright Futures*. Washington, DC: Maternal and Child Health Bureau and American Academy for Pediatrics; 2005. Available at <http://brightfutures.aap.org>.
166. A review of community health centers: issues and opportunities. Hearing before the Committee on Energy and Commerce, Subcommittee on Oversight and Investigations, 111th Congress (May 25, 2005).
167. Health Disparities Collaboratives. *Health Disparities Collaboratives*. Rockville, MD: US Department of Health and Human Services, Health Resources and Services Administration, Bureau of Primary Health Care; 2005. Available at <http://www.healthdisparities.net>.
168. National Center for Health Statistics. *Ambulatory health care data: NAMCS description*. Washington, DC: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2004. Available at <http://www.cdc.gov/nchs/about/major/ahcd/namcsdes.htm>.
169. Kushner K, Ange E. *Women's health: prevention and promotion*. Washington, DC: National Institute for Health Care Management Foundation; 2005.
170. National Committee for Quality Assurance. *Checkups after delivery: improving program participation*. Washington, DC: National Committee for Quality Assurance; 2002.
171. MacDorman MF, Martin JA, Mathews TJ, Hoyert DL, Ventura SJ. Explaining the 2001–02 infant mortality increase: data from the linked birth/infant death data set. *Natl Vital Stat Rep* 2005;53:1–22.
172. Mercer BM, Goldenberg RL, Moawad AH, et al. The preterm prediction study: effect of gestational age and cause of preterm birth on subsequent obstetric outcome: National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. *Am J Obstet Gynecol* 1999;181:1216–21.
173. Surkan PJ, Stephansson O, Dickman PW, Cnattingius S. Previous preterm and small-for-gestational-age births and the subsequent risk of stillbirth. *N Engl J Med* 2004;350:777–85.
174. CDC. Improved national prevalence estimates for 18 selected major birth defects—United States, 1999–2001. *MMWR* 2006;54(51,52):1301–5.
175. Boulet S, Johnson K, Parker C, Posner S, Atrash H. A perspective of preconception health activities in the United States. *Matern Child Health J*. In press 2006.
176. Klerman LV, Cliver SP, Goldenberg RL. The impact of short interpregnancy intervals on pregnancy outcomes in a low-income population. *Am J Public Health* 1998;88:1182–5.
177. Robert W. Wood Health Sciences Center. Alfred Brann, M.D., leads new low birth weight at Grady Memorial Hospital. Atlanta, GA: Robert W. Wood Health Sciences Center; 2002.
178. Healthy Start National Resource Center. *Healthy Start resource guide 2000*. Arlington, VA: National Center for Education in Maternal and Child Health; 2000.
179. Magnolia Project. *The Magnolia Project: Jacksonville Healthy Start Initiative*. Jacksonville, FL: Magnolia Project; 2001.
180. Kaiser Family Foundation. *Women's health insurance coverage*. Washington, DC: Kaiser Family Foundation; 2004.
181. Kaiser Family Foundation. *Medicaid's role for women: issue brief on women's health policy*. Washington, DC: Kaiser Family Foundation; 2004.
182. Kaiser Family Foundation. *Medicaid: a critical source of support for family planning in the United States: issue brief on women's health policy*. Washington, DC: Kaiser Family Foundation; 2005.
183. Ross C, Cox L. *Beneath the surface: barriers threaten to slow progress on expanding health coverage of children and families*. Washington, DC: Kaiser Family Foundation, Kaiser Commission on the Future of Medicaid and the Uninsured; 2004.
184. Gold R. *Doing more for less: study says state Medicaid family planning expansions are cost effective*. *Gutmacher Rep Public Policy* 2004;7:1–2.
185. Frost JJ, Frohwirth L, Purcell A. The availability and use of publicly funded family planning clinics: U.S. trends, 1994–2001. *Perspect Sex Reprod Health* 2004;36:206–15.
186. Bartlett S, Olvera R, Bobronnikov E, et al. *WIC participant and program characteristics, 2002, WIC-03-PC*. Alexandria, VA: US Department of Agriculture, Food and Nutrition Service, Office of Analysis, Nutrition and Evaluation; 2003.
187. US Department of Health and Human Services. *From data to action: CDC's public health surveillance for women, infants, and children*. Washington, DC: US Department of Health and Human Services, Public Health Service; 1994.
188. Grosse SD, Sotnikkov SV, Leatherman S, Curtis M. The business case for preconception care: methods and issues. *Matern Child Health J*. In press 2006.
189. Jiles R, Hughes E, Murphy W, et al. Surveillance for certain health behaviors among states and selected local areas—Behavioral Risk Factor Surveillance System, United States, 2003. *MMWR* 2005;54:1–116.
190. CDC. *Surveillance for selected maternal behaviors and experiences before, during, and after pregnancy. Pregnancy Risk Assessment Monitoring System (PRAMS), 2000*. *MMWR* 2003;52:1–14.
191. Groves RM, Benson G, Mosher WD, et al. Plan and operation of Cycle 6 of the National Survey of Family Growth. *Vital Health Stat* 2005;42:1–86.
192. Burns PG. Reducing infant mortality rates using the perinatal periods of risk model. *Public Health Nurs* 2005;22:2–7.
193. Misra DP, Grason H, Liao M, Strobino DM, McDonnell KA, Allston AA. The nationwide evaluation of fetal and infant mortality review (FIMR) programs: development and implementation of recommendations and conduct of essential maternal and child health services by FIMR programs. *Matern Child Health J* 2004;8:217–29.
194. CDC. *Methodology of the youth risk behavior surveillance system*. *MMWR* 2004;53(No. RR-12):1–13.
195. National Committee for Quality Assurance. *HEDIS 1999: technical specifications*. Washington, DC: National Committee for Quality Assurance; 1999.

Appendix

External Partner Organizations

American Academy of Family Physicians (AAFP)
American Academy of Pediatrics (AAP)
American College of Nurse-Midwives (ACNM)
American College of Obstetricians and Gynecologists (ACOG)
American College of Osteopathic Obstetricians and Gynecologists (ACOOG)
American Osteopathic Association (AOA)
Association of Asian Pacific Community Health Organizations (AAPCHO)
Association of Maternal and Child Health Programs (AMCHP)
Association of State and Territorial Health Officials (ASTHO)
Associations of Women's Health, Obstetric and Neonatal Nurses (AWHONN)
CityMatCH
Healthy Start Coalition of Miami-Dade
March of Dimes (MOD)
March of Dimes Advisory Council

Maternity Center Association (MCA)
National Alliance for Hispanic Health
National Association of Community Health Centers (NACHC)
National Association of County and City Health Officials (NACCHO)
National Birth Defects Prevention Network (NBDPN)
National Foundation for Infectious Diseases
National Healthy Mothers, Healthy Babies Coalition
National Healthy Start Association (NHSA)
National Hispanic Medical Association (NHMA)
National Medical Association (NMA)
National Partnership to Help Pregnant Smokers Quit; Smoke-Free Families
National Perinatal Association (NPA)
National Society of Genetic Counselors (NSGC)
Society for Maternal Fetal Medicine (SMFM)
Task Force for Child Survival and Development
The Jacobs Institute for Women's Health (JIWH)

CDC/ATSDR Preconception Care Work Group

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MMWRTM

Morbidity and Mortality Weekly Report

Recommendations and Reports

April 21, 2006 / Vol. 55 / No. RR-6

Continuing Education Activity Sponsored by CDC

Recommendations To Improve Preconception Health and Health Care — United States A Report of the CDC/ATSDR Preconception Care Work Group and the Select Panel on Preconception Care

EXPIRATION — April 21, 2009

You must complete and return the response form electronically or by mail by **April 21, 2009**, to receive continuing education credit. If you answer all of the questions, you will receive an award letter for 1.75 hours Continuing Medical Education (CME) credit; 0.15 Continuing Education Units (CEUs); or 2.0

contact hours Continuing Nursing Education (CNE) credit. If you return the form electronically, you will receive educational credit immediately. If you mail the form, you will receive educational credit in approximately 30 days. No fees are charged for participating in this continuing education activity.

INSTRUCTIONS

By Internet

1. Read this *MMWR* (Vol. 55, RR-6), which contains the correct answers to the questions beginning on the next page.
2. Go to the *MMWR* Continuing Education Internet site at <http://www.cdc.gov/mmwr/cme/conted.html>.
3. Select which exam you want to take and select whether you want to register for CME, CEU, or CNE credit.
4. Fill out and submit the registration form.
5. Select exam questions. To receive continuing education credit, you must answer all of the questions. Questions with more than one correct answer will instruct you to "Indicate all that apply."
6. Submit your answers no later than **April 21, 2009**.
7. Immediately print your Certificate of Completion for your records.

By Mail or Fax

1. Read this *MMWR* (Vol. 55, RR-6), which contains the correct answers to the questions beginning on the next page.
2. Complete all registration information on the response form, including your name, mailing address, phone number, and e-mail address, if available.
3. Indicate whether you are registering for CME, CEU, or CNE credit.
4. Select your answers to the questions, and mark the corresponding letters on the response form. To receive continuing education credit, you must answer all of the questions. Questions with more than one correct answer will instruct you to "Indicate all that apply."
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ACCREDITATION

Continuing Medical Education (CME). CDC is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians. CDC designates this educational activity for a maximum of 1.75 hours in category 1 credit toward the AMA Physician's Recognition Award. Each physician should claim only those hours of credit that he/she actually spent in the educational activity.

Continuing Education Unit (CEU). CDC has been approved as an authorized provider of continuing education and training programs by the International Association for Continuing Education and Training. CDC will award 0.15 continuing education units to participants who successfully complete this activity.

Continuing Nursing Education (CNE). This activity for 2.0 contact hours is provided by CDC, which is accredited as a provider of continuing education in nursing by the American Nurses Credentialing Center's Commission on Accreditation.

Goals and Objectives

This report provides an updated review of the evidence for interventions to improve the health of women before pregnancy. The goal of this report is to present 10 recommendations to improve preconception care, focusing on specific activities at the individual, clinical, public health, community, and research levels. Upon completion of this educational activity, the reader should be able to 1) describe the need for preconception health for families, 2) define preconception care, 3) list the 10 recommendations for improving preconception care, 4) list specific action steps for each recommendation, 5) describe the interventions for improving preconception health that are supported by professional guidelines, 6) describe the responsibilities of persons concerned with preconception health, and 7) describe areas of preconception health care that need further research.

To receive continuing education credit, please answer all of the following questions.

1. **Preconception care is a single visit only for those women who are trying to get pregnant.**
 - A. True.
 - B. False.
2. **Preconception care includes...**
 - A. health promotion only.
 - B. screening only.
 - C. risk reduction interventions only.
 - D. all of the above.
3. **Clinical practice guidelines for preconception risk factors have been developed for...*(Indicate all that apply.)***
 - A. folic acid deficiency.
 - B. rubella.
 - C. diabetes.
 - D. hypothyroidism.
 - E. All of the above.
4. **Women with a previous adverse pregnancy outcome are at increased risk for a subsequent adverse outcome.**
 - A. True.
 - B. False.
5. **Preconception care is most important for women before the first pregnancy and is not a priority for subsequent pregnancies.**
 - A. True.
 - B. False.
6. **The content of preconception care is the same for everyone.**
 - A. True.
 - B. False.
7. **Clinical medicine, public health, communities, individuals, and researchers all have important roles and responsibilities for improving preconception health.**
 - A. True.
 - B. False.
8. **One of the recommendations for improving preconception health is to increase the number of women who have access to care before, during, and after pregnancy.**
 - A. True.
 - B. False.
9. **Clinicians are reimbursed for one preconception care visit per year for insured women.**
 - A. True.
 - B. False.
10. **Several national surveillance systems provide estimates of the frequency and content of preconception care visits.**
 - A. True.
 - B. False.
11. **Which best describes your professional activities?**
 - A. Physician.
 - B. Nurse.
 - C. Health educator.
 - D. Office staff.
 - E. Other.
12. **I plan to use these recommendations as the basis for...*(Indicate all that apply.)***
 - A. health education materials.
 - B. insurance reimbursement policies.
 - C. local practice guidelines.
 - D. public policy.
 - E. other.
13. **Overall, the length of the journal report was...**
 - A. much too long.
 - B. a little too long.
 - C. just right.
 - D. a little too short.
 - E. much too short.
14. **After reading this report, I am confident I can describe the need for preconception health for families.**
 - A. Strongly agree.
 - B. Agree.
 - C. Undecided.
 - D. Disagree.
 - E. Strongly disagree.
15. **After reading this report, I am confident I can define preconception care.**
 - A. Strongly agree.
 - B. Agree.
 - C. Undecided.
 - D. Disagree.
 - E. Strongly disagree.
16. **After reading this report, I am confident I can list the 10 recommendations for improving preconception care.**
 - A. Strongly agree.
 - B. Agree.
 - C. Undecided.
 - D. Disagree.
 - E. Strongly disagree.
17. **After reading this report, I am confident I can list specific action steps for each recommendation.**
 - A. Strongly agree.
 - B. Agree.
 - C. Undecided.
 - D. Disagree.
 - E. Strongly disagree.

- 18. After reading this report, I am confident I can describe the interventions for improving preconception health that are supported by professional guidelines.
 - A. Strongly agree.
 - B. Agree.
 - C. Undecided.
 - D. Disagree.
 - E. Strongly disagree.
- 19. After reading this report, I am confident I can describe the responsibilities of persons concerned with preconception health.
 - A. Strongly agree.
 - B. Agree.
 - C. Undecided.
 - D. Disagree.
 - E. Strongly disagree.
- 20. After reading this report, I am confident I can describe areas of preconception health care that need further research.
 - A. Strongly agree.
 - B. Agree.
 - C. Undecided.
 - D. Disagree.
 - E. Strongly disagree.

- 21. The learning outcomes (objectives) were relevant to the goals of this report.
 - A. Strongly agree.
 - B. Agree.
 - C. Undecided.
 - D. Disagree.
 - E. Strongly disagree.
- 22. The instructional strategies used in this report (text, boxes, and appendix) helped me learn the material.
 - A. Strongly agree.
 - B. Agree.
 - C. Undecided.
 - D. Disagree.
 - E. Strongly disagree.
- 23. The content was appropriate given the stated objectives of the report.
 - A. Strongly agree.
 - B. Agree.
 - C. Undecided.
 - D. Disagree.
 - E. Strongly disagree.

(Continued on pg CE-4)

MMWR Response Form for Continuing Education Credit
April 21, 2006/Vol. 55/No. RR-6

Recommendations To Improve Preconception Health and Health Care — United States
A Report of the CDC/ATSDR Preconception Care Work Group
and the Select Panel on Preconception Care

To receive continuing education credit, you must

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Check One

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Fill in the appropriate blocks to indicate your answers. Remember, you must answer all of the questions to receive continuing education credit!

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| 3. [] A [] B [] C [] D [] E | [] E | 18. [] A [] B [] C [] D [] E | [] E |
| 4. [] A [] B | [] E | 19. [] A [] B [] C [] D [] E | [] E |
| 5. [] A [] B | [] E | 20. [] A [] B [] C [] D [] E | [] E |
| 6. [] A [] B | [] E | 21. [] A [] B [] C [] D [] E | [] E |
| 7. [] A [] B | [] E | 22. [] A [] B [] C [] D [] E | [] E |
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| 11. [] A [] B [] C [] D [] E | [] E | 26. [] A [] B [] C [] D [] E | [] E |
| 12. [] A [] B [] C [] D [] E | [] E | 27. [] A [] B [] C [] D [] E | [] E |
| 13. [] A [] B [] C [] D [] E | [] E | 28. [] A [] B [] C [] D [] E | [] E |
| 14. [] A [] B [] C [] D [] E | [] E | 29. [] A [] B | [] E |
| 15. [] A [] B [] C [] D [] E | [] F | 30. [] A [] B [] C [] D [] E [] F | [] F |

Signature _____ **Date / Completed Exam** _____

24. The content expert(s) demonstrated expertise in the subject matter.

- A. Strongly agree.
- B. Agree.
- C. Undecided.
- D. Disagree.
- E. Strongly disagree.

25. Overall, the quality of the journal report was excellent.

- A. Strongly agree.
- B. Agree.
- C. Undecided.
- D. Disagree.
- E. Strongly disagree.

26. These recommendations will improve the quality of my practice.

- A. Strongly agree.
- B. Agree.
- C. Undecided.
- D. Disagree.
- E. Strongly disagree.

27. The availability of continuing education credit influenced my decision to read this report.

- A. Strongly agree.
- B. Agree.
- C. Undecided.
- D. Disagree.
- E. Strongly disagree.

28. The *MMWR* format was conducive to learning this content.

- A. Strongly agree.
- B. Agree.
- C. Undecided.
- D. Disagree.
- E. Strongly disagree.

29. Do you feel this course was commercially biased? (*Indicate yes or no; if yes, please explain in the space provided.*)

- A. Yes.
- B. No.

30. How did you learn about the continuing education activity?

- A. Internet.
- B. Advertisement (e.g., fact sheet, *MMWR* cover, newsletter, or journal).
- C. Coworker/supervisor.
- D. Conference presentation.
- E. *MMWR* subscription.
- F. Other.

Correct answers for questions 1-10.
1. B; 2. D; 3. E; 4. A; 5. B; 6. B; 7. A; 8. A; 9. B; 10. B

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